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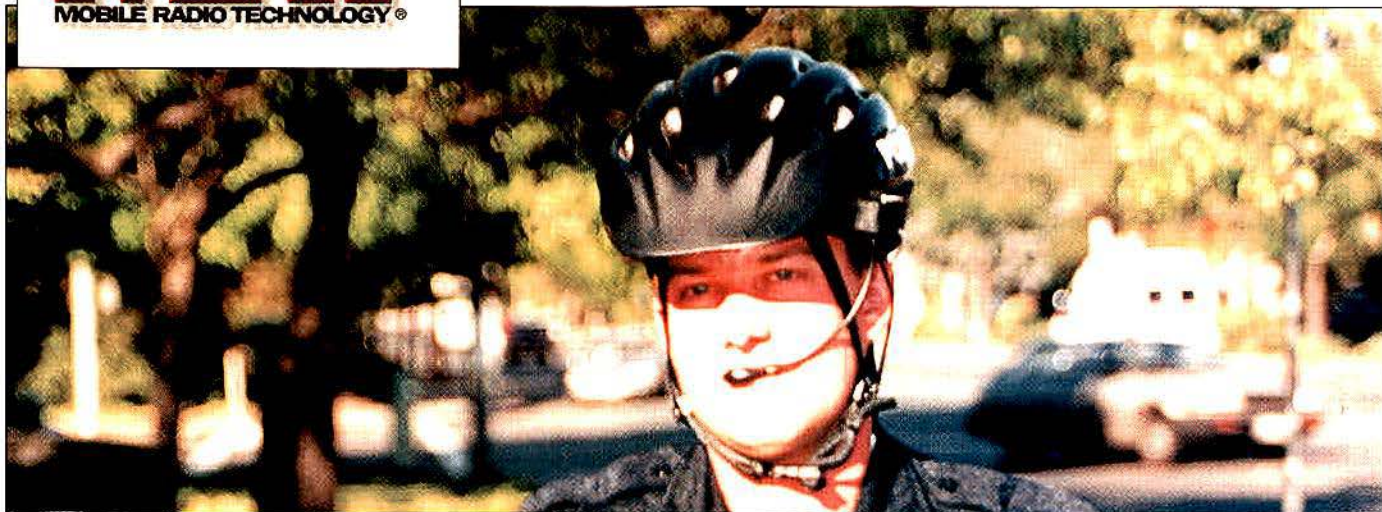
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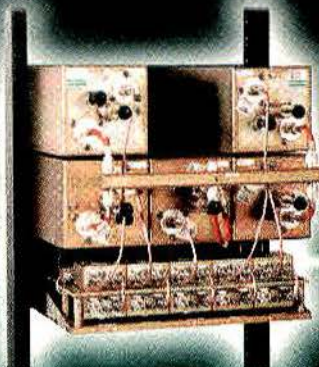
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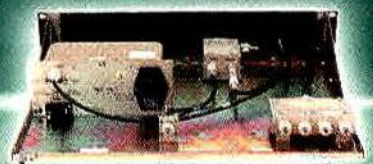


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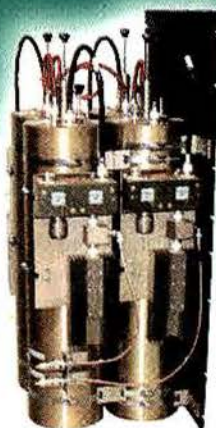
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FCC flexes auction muscle; private radio caught in the squeeze

For an agency bent on auctioning private radio frequencies, the answer is to convert shared frequencies to exclusive. The way to do that might be to convert them from site-specific shared licensing to geographic area exclusive licensing, and then call for applications.

The agency cites a U.S. Court of Appeals decision that supports its view that it does not have to adhere to a particular licensing scheme or methodology to avoid mutual exclusivity if it finds that another method better serves the public interest. The court decision had to do with direct broadcast satellite licensing, but the FCC sees a parallel with private radio licensing, too.

The commission sees a higher public interest in issuing geographic area exclusive licenses than in issuing site-specific licenses on shared frequencies. Among the public interests that would be served are the development and rapid deployment of new technologies and services and ready accessibility to them; economic opportunity and competition; recovery of a portion of the value of the spectrum for the benefit of the public; and efficient and intensive use of spectrum.

Look, it's going to be a fight. In FCC language, "We have previously observed that the use of competitive bidding to assign geographic overlay licenses in private radio services would promote spectrum efficiency."

One key disagreement is that many private radio licensees are better served by site-specific licenses. They also don't want to own spectrum. They want to run their businesses. Many of them lease their real estate and equipment, and they would just as soon lease their radio licenses. The commission thinks there's an overriding public interest in auctioning the spectrum anyway, and the private radio licensees either will have to convince the FCC not to, or persuade Congress to change the law to prevent it. Given that the FCC has the will to interpret current law and possible new law to support its view on auctions, it won't be easy for private radio licensees to defend their position.

There's a lot to the proposed rulemaking, which runs 30+ single-spaced pages as downloaded here from the Wireless Telecommunications Bureau Web site. Included is a plan for "band managers" that would buy private radio geographic overlay licenses. Band managers then would function as frequency coordinator-and-FCC rolled into one, doling out

sublicenses to private users for a fee. Better get a copy of the rulemaking notice for yourself.

Meanwhile, two more highlights

The end of community repeaters?

In 1992, the FCC proposed eliminating multiple-licensed systems, also known as community repeaters, because, from a user's standpoint, such facilities were indistinguishable from SMR facilities. Moreover, users' needs could be met by SMR and private carrier licensees. Instead, taking a cue from its interpretation of the 1993 Budget Act, the FCC concluded that Congress recognized benefits in cost-sharing arrangements such as community repeaters, wanted to keep them classified as private radio, and wanted to exempt them from auctions.

The FCC sees community repeaters and other not-for-profit systems structured to give an unlicensed manager sufficient operational control to provide for-profit service to customers as a violation of the law and its rules for which the system license can be revoked. Sham not-for-profit operations compete with CMRS licensees that are required to obtain their licenses in auctions. Accordingly, the agency seeks comment on whether to eliminate or modify the multiple-licensing rules.

Mutually exclusive public safety

The FCC doesn't expect to have to resolve many mutually exclusive public safety frequency applications if those applications continue to be frequency-coordinated prior to filing, whether the requests are for site-specific or geographic area licensing. Even so, the agency seeks comment about how to avoid or how to resolve mutually exclusive public safety applications. You see, the FCC cannot resolve mutually exclusive public safety applications with an auction. Yet its available tools are many: engineering solutions, negotiation, threshold qualifications, service regulations, comparative hearings and first-come-first-served processing, to name a few. Which to use, and under what circumstances?

Fasten your private land mobile radio seat belts. It's going to be a bumpy ride.

We're talking FCC rulemaking. We're talking "Implementation of Sections 309(j) and 337 of the Communications Act of 1934 as Amended." We're talking "Promotion of Spectrum Efficient Technologies on Certain Part 90 Frequencies."

Keep talking

Released on March 25, the FCC's Notice of Proposed Rulemaking No. RM-9332 in WT Docket No. 99-87 initiates a proceeding to implement the commission's revised spectrum auction authority. The proceeding has the potential to work yet another fundamental change on a private radio industry already buffeted by extra regulation (in many cases) as commercial carriers, government-sanctioned spectrum warehousing by a single large carrier, license freezes and unequal treatment of industrial and public safety radio. If the question were asked, "What else could happen?"—this might be it!

The commission noted that the Balanced Budget Act of 1997 changed the Communications Act such that the agency no longer has to decide which radio services are auctionable based on whether the service is used principally for subscriber-based services. The FCC has concluded that a service is auctionable if the agency implements a licensing process that permits the filing and acceptance of mutually exclusive applications—providing the service is not otherwise exempt. So ... change the licensing process, and extend auctions to private radio. Easy.

For example: Applications on shared private radio frequencies are not mutually exclusive. No auction. Applications on non-shared, or exclusive use, frequencies are mutually exclusive if they have overlapping coverage areas and are filed at the same time. Auction.

Don Bishop

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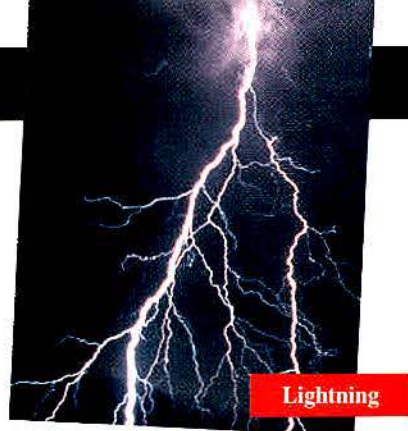
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PLUS: Harold Kinley's "Technically Speaking"; Robert H. Schwaninger Jr.'s "In the Public Interest"; Don Bishop's editorial; product focus: power supplies.

AND IN THE MONTHS TO COME: microphones; microwave links; computer-aided dispatch; fire radio and data; railroad communications; the changing face of paging; system upgrades; location technologies.



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10-13—Telecommunications Resellers Association Spring Conference and Exposition, San Diego Marriott. Contact: 202-835-9898.

June

1-3—Canadian Wireless, sponsored by the Canadian Wireless Telecommunications Association, Vancouver, Canada. Contact: 613-233-4888, ext. 102.

6-10—Supercomm, sponsored by the TIA and USTA, Georgia World Congress Center, Atlanta. Contact: 800-278-7372.

27-July 1—UTC Telecom '99, sponsored by UTC, Nashville, TN. Contact: 202-857-1881.

28-29—Leadership Conference & Annual Meeting, sponsored by AMTA, ANA Hotel, Washington, DC. Contact: 202-337-7773.

July

14-16—Communications Expo/Show of the Americas, Miami Beach Convention Center, Miami. Contact: Jackie Gonzales, 305-412-9000.

26-28—Telecommunications Resellers Association Summer Carrier Forum, Westin Harbor Castle, Toronto, Ontario Canada. Contact: 202-835-9898.

August

8-12—Association of Public-Safety Communications Officials—International (APCO)

National Conference, Minneapolis. Contact: 904-322-2500.

September

23-25—Personal Communication Showcase, sponsored by Personal Communications Industry Association, New Orleans. Contact: 703-739-0300.

October

2-4—Wireless I.T. '99, sponsored by the Cellular Telecommunications Industry Association, Santa Clara, CA. Contact: 202-785-2842.

18-21—Annual APCO Canada Conference, sponsored by APCO, New Brunswick Canada. Contact: Jim Flanagan 888-CANAPCO.

27-30—Industrial Telecommunication Association/USMSS joint Conference, sponsored by ITA and USMSS, Grand Hyatt, Washington, DC. Contact: 703-528-5115.

November

2-4—Wireless I.T., sponsored by the Cellular Telecommunications Industry Association, Santa Clara Convention Center, Silicon Valley, CA. Contact: 202-785-2842.

10-14—Communications Marketing Conference, sponsored by the Communications Marketing Association, Harvey Hotel, Dallas. Contact: Jack Armstrong, 410-628-9300.

15-16—AMTEX, sponsored by the American Mobile Telecommunications Association, Hilton,

Walt Disney World Village, Lake Buena Vista, FL. Contact: 202-331-7773.

15-16—Fourth International Congress on Commercial Trunked Radio, sponsored by the International Mobile Telecommunications Association, Hilton, Walt Disney World Village, Lake Buena Vista, FL. Contact: 202-331-7773.

17-19—TelecomLatina, co-sponsored by *Mobile Radio Technology*, Miami Beach Convention Center, Miami. Contact: 800-288-8606.

19—Radio Club of America Communications Symposium, 91st Anniversary Dinner and Awards Presentation, New York Athletic Club, New York. Contact: Gerri Hopkins, 732-842-5070.

2000

February

28-March 1—Wireless 2000, sponsored by the Cellular Telecommunications Industry Association, Ernest Morial Convention Center, New Orleans. Contact: 202-785-0081.

March

19-22—ENTELEC 2000, sponsored by ENTELEC, Dallas Convention Center, Dallas. Contact: 281-357-8700.

April

26-28—International Wireless Communications Expo, co-sponsored by *Mobile Radio Technology*, Las Vegas Convention Center, Las Vegas. Contact: 800-288-8606.

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See us at IWCE, Booth #1459.



Cooperate to combat interference

If you ask your average wireless professionals what their biggest problem is these days, you have a 99.9% chance that they will give you a concise, one-word answer: "Interference." That was the overwhelming response at the small business roundtable discussions at the American Mobile Telecommunications Association (AMTA) Specialized Wireless Management Conference in March.

Interference is a nuisance, it affects everyone, and no one has developed a foolproof solution. Hundreds of people are currently searching for this elusive solution, however. It's going to be rough

until someone finds one. Unfortunately, spectrum is a finite resource, and there just isn't enough to go around. Everyone either has to learn to share, or innovators need to keep making spectrum more and more efficient.

The FCC spectrum regulations that deal with interference are pitifully inadequate, which doesn't help matters at all. Even if everyone follows the rules, which most people do, the regulations may hardly scratch the surface of eliminating interference, which, ironically, is their sole purpose. That is what makes this problem especially frustrating. Organizations that are all doing their parts and playing by all the rules still are the victims of damaging and annoying interference. Until the day when there is no more interference, wouldn't it be nice to have a way to minimize the annoyance and inconvenience in the meantime? Well, guess what! There is one.

Keller McCrary is an SMR operator in Dallas. He has organized a group of other operators in his area with interference problems into a sort of cooperative. They've adopted the idea that "Helping you helps me," and they meet regularly to discuss interference problems. The contributors sit back and listen to what their co-sufferers have to say about their individual problems with interference. Together, they made a "Gentleman's Agreement" to stay out of one another's way and to find a method that will allow them all to use their equipment the way they want to, and at the same time, cause the least amount of interference. If they all agree to play by these unofficial rules, everyone can operate a lot easier without having to buy expensive equipment to try to block out the interfering chatter.

This system has been working reasonably well for quite a while. I've heard McCrary at this event and at AMTEX last November, recommend his plan of action to anyone having problems similar to what he had been experiencing. It's so shockingly logical that it seems like it couldn't possibly work, but it does. Right now, it's the best way to go about minimizing the effects of interference until the FCC or somebody else comes up with regulations that everyone will follow and that actually solve the problem of interference. So run out and get together with your competitors and work something out that will help you all in the meantime. Hey, it certainly couldn't hurt.

—Emily Reid
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Jorgensen responds to Project 25 opinion

Craig Jorgensen, a co-chairman of the Project 25 Steering Committee, sent a letter responding to Emily Reid's column "What on Earth Is Taking So Long" in the February "Editorial Forum." Mr. Jorgensen's letter would take two pages to print, and the "Letters" department normally cannot be made that long. This month's column does not offer an exception to that constraint. To read

Mr. Jorgensen's entire letter, please visit the following Web page: www.mrtmag.com/news.htm.

Mr. Jorgensen takes the editorial comment apart point by point, and he expresses strong disagreement with some of the column's assumptions and characterizations. He finds the reporting that "rumors of Mafia-like, conspiracy theory-type antics are floating around the industry" indicates that either he or Ms.

Reid is misinformed or, at worst, that the magazine is on the verge of practicing yellow journalism. Yellow journalism refers to publishing information known by the writer or publisher to be false, and doing so for the purpose of causing a sensation that boosts circulation.

Mr. Jorgensen's letter is thoughtful, detailed and written in the spirit of shedding additional light on the subject. Although he is largely in disagreement with Ms. Reid's column, he finds several points worth consideration by those involved in the standards process. I hope you'll take advantage of the opportunity to read the entire letter on the Web site.

—Don Bishop

Project 25 editorial a public service?

After reading the article "What on Earth Is Taking So Long?" ("Editorial Forum," February 1999 *MRT*), I should only say one thing. "WOW!!!"

As a member of a team that has been involved in the debate over the benefits and disadvantages of Project 25 for far too many years, it was very pleasing to finally see an objective assessment of what has happened by someone other than a proponent or opponent who has been involved for an extended period. Frequently it becomes impossible for all involved to step back and see things in an unimpassioned light after so much has been invested. You have performed a true public service by exposing the issues in an unimpassioned, unbiased light.

Surely most of what was said could have been said any number of years ago, but the impact of your assessment is not diminished by the passage of time. In fact, because of some external developments that are occurring right now, the impact of your message might even be enhanced.

—Bob Speidel

Manager, Regulatory Programs
Ericsson Private Radio Systems

An answer to the Project 25 question

I participated a fair amount during the early stages of the APCO 25 effort and offer the following comments. There are three main reasons APCO 25 has not taken off:

□ The FCC has only loosely mandated transitioning to narrowband channels.

□ Some of the vendors and users participating in this effort have been less cooperative than others.

□ People are market-driven.

As you are well aware, frequencies on the commercial side are controlled by the FCC.

Continued on page 16

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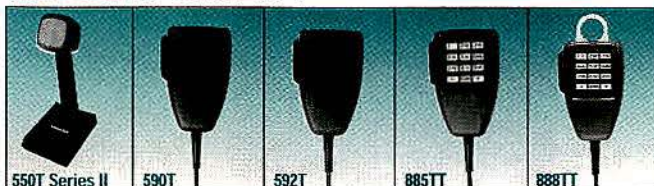
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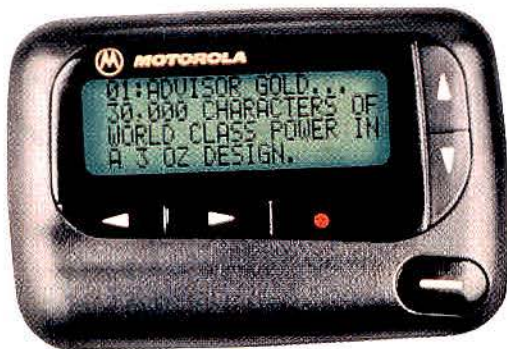
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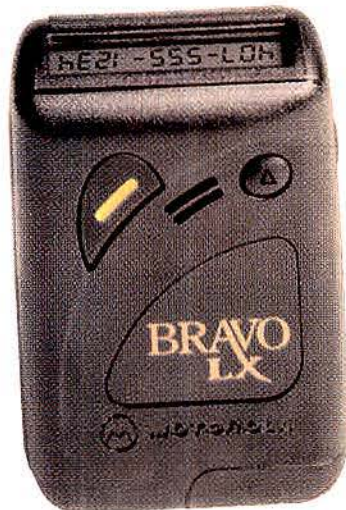
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By comparison, frequencies used by federal agencies are controlled by the National Telecommunications and Information Agency (NTIA). NTIA has mandated a complete transition to narrowband frequencies by 2005 or 2008, depending on the frequency band. The main reason for this is the federal government's selling off of frequencies to pay down the national debt. The FCC has only required new equipment to be type-accepted for narrowband operation. This means manufacturers, but they must incorporate narrowband operation in their new designs. The federal government has only 7.5%–10% of the land mobile radio market. With such a

small share there is little motivation for manufacturers to transition to a narrowband product.

It should be understood the APCO 25 effort is made up of a large group of contractors and users trying to develop a standard. Every one of them is very concerned about ensuring their interests are protected, and this is only natural. Unfortunately, it appears to me that the goal of some of the vendors participating was to kill the whole process. Perhaps they had no interest in achieving interoperability or, as the editorial suggests, they were going the "to-heck-with-it" route.

Everything in the United States is market

driven. A better mousetrap will not get sold unless the market is there. Converting an analog voice signal to digital, then squeezing it into a 12.5kHz channel and having the distant end produce good voice quality is not trivial. It requires the application of new technologies costing more money. Some people say it does not sound as good as analog. The price of APCO 25 equipment will not drop until there is a large market for a narrowband digital radio.

All these reasons combine to impact the acceptance of a new standard. We should remember ISDN is only recently gaining acceptance, and it has been around a long, long, time.

—Scott D. Gardner, P.E.
Air Force Communications Agency
Scott AFB, IL

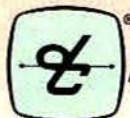
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T-4

Project 25 has taken a long time

We in the industry appreciate and share your frustration with the amount of time it has taken to implement the Project 25 digital radio standard ("Editorial Forum," February 1999, *MRT*). After all, we know firsthand—we have participated and supported the development of that standard over this extended time period. The effort has been worth it. As you point out, "interoperability is, without a doubt, a noble cause." It is assumed that you also support the other Project 25 objectives you discussed in your editorial: maximum spectrum efficiency, competition and a user-friendly interface.

Clearly, there has been excellent progress in the availability of Project 25 compliant equipment to public safety market. At the APCO Annual Convention last August, interoperable Project 25 radios were demonstrated from various vendors, including Motorola, Transcrypt, B/K Radio, ADI and Racal. Recently, the U.S. Department of the Interior awarded a contract for Project 25 compliant equipment to various vendors who had provided demonstrable equipment for evaluation.

Industry continues to invest a considerable amount of money into the development of Project 25 equipment. It is now up to the public safety market to decide if there will really be competition, or if the "public safety superpower" (as you said in your editorial) will become a *de facto* monopoly.

As you point out in your article, it's been 10 years to get to this point in providing a narrowband, digital radio standard. Who knows how much longer it will take if we do as you suggest—start over.

Again, we share your frustration. We've been working very hard to provide public safety users with an interoperable and competitive product. We're now ready.

—Mitchell H. Herberts
Senior Vice President
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Ten silly things wireless people do to mess up their lives

By Robert H. Schwaninger Jr.

Hi, this is "Dr." Robert Schwaninger, and I am my client's mouthpiece.

Over the course of a few weeks, I get a number of calls from clients asking what they should do about this situation or that. Usually the advice is specific to their particular situation. Should they construct a fill-in? What should they do with their interconnection problems with a local exchange carrier? What color yagi will go best with their tower?

Here is a repeat of some advice on a variety of topics that might save us both a phone call. Although I cannot address every issue that might be on your mind (like whether Congress will ever recognize that everyone in this industry does not have a globe or a bell in their corporate logo) these tips might help with some nagging problems or suggestions.

1. Put your house in order

CALLER: Hi Dr. Robert. My bookkeeper keeps nagging me to clean up my licenses. What's the big deal?

DR. ROBERT: If you haven't done an inventory of your licenses, or if you are in anything resembling a "gray area" of compliance—fix it. Whether you want to believe it or not, the FCC is beginning to deal with a lot of these issues, assigning actual lawyers to look at complaints. Better to avoid the whole expensive mess and make sure that coordinates, power and mobile count are

fixed, rather than spending money trying to explain that you always meant to do the right thing—you just hadn't gotten around to it.

2. Protect your reputation

CALLER: Dr. Robert, I'm a good per-

son, so why does the FCC say mean things about me?

3. Don't try to get away with it

CALLER: So what if I neglect tower registration? Everybody does it.

DR. ROBERT: If you've been skipping the tower blanks on Form 600 because the FCC hasn't been checking them thoroughly—cut that out. The FCC's antenna survey branch is culling and tossing applica-

tions that do not comport with the rules. They are checking the information against their tower registration records, their FAA records and a few Jerry Vale records. If it doesn't match, it's getting bounced. (However, will somebody please tell the FCC's newly zealous employees that you *don't* need to register sites that are not subject to FAA clearance!)

The more likely avenue to getting a forfeiture letter will be the failure to register your site. If your site requires FAA approval, it's got to be registered. If you haven't gotten around to filling out a Form 854 for your FAA-approved tower—do it. This is one area where the FCC is quite serious, and it's easy for the FCC to check.

4. Practice safe radio

CALLER: Dr. Robert, I find emissions checks too confining. What's wrong with being natural?

DR. ROBERT: As for RF emissions checks, the FCC is semi-serious about this program. I don't know of anyone getting busted for non-compliance, but look

for the agency to make a few examples as it tries to look like it cares about whether technicians will be glowing in the dark.

5. You won't get a date if you don't ask

CALLER: Dr. Robert, I'd like more spectrum, but I'm too shy to go to an auction. What do I do?

DR. ROBERT: If you are one of those companies that has decided that auctions are too expensive—so you'll concentrate

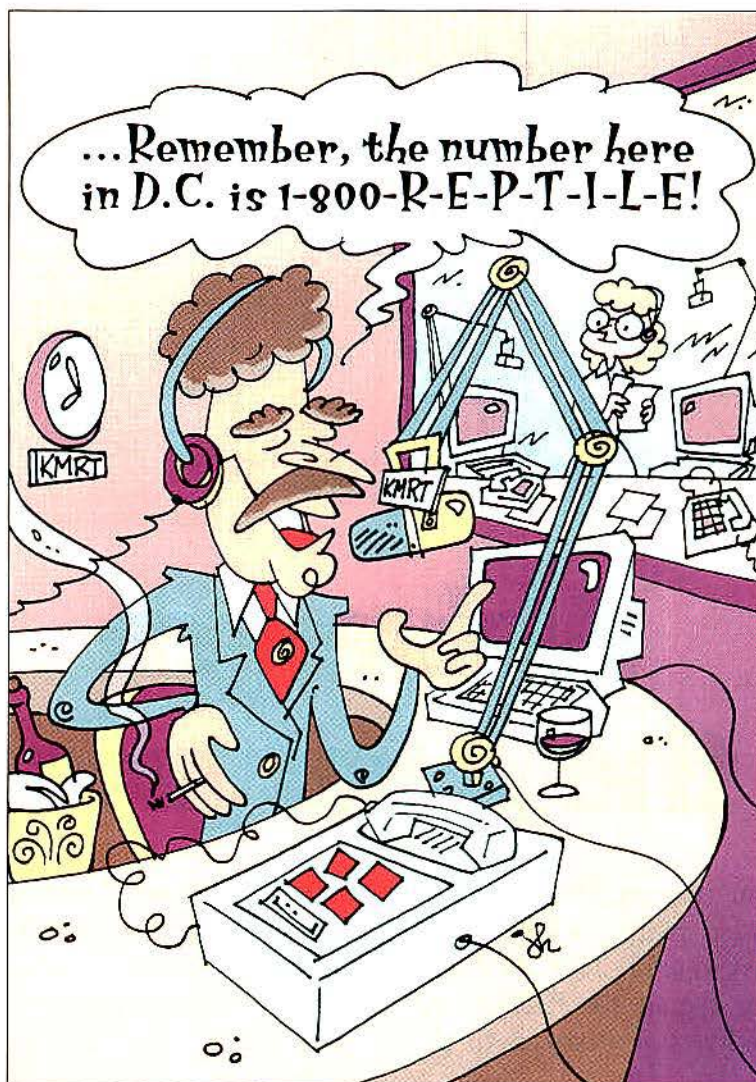


Illustration by John Hayes

son, so why does the FCC say mean things about me?

DR. ROBERT: Check the FCC Web site and see if the "all new and exciting" electronic database (the devil's spawn of the still-under-construction Universal Licensing System) has your licensing data properly entered. It won't be long before the FCC starts acting as though the contents of this cyber-behemoth are divinely inspired. Better to get your information correct now, rather than waiting to try

Schwaninger, MRT's regulatory consultant, is the principal in the law firm of Schwaninger & Associates, Washington. He is general counsel to Small Business in Telecommunications and a member of the Radio Club of America.

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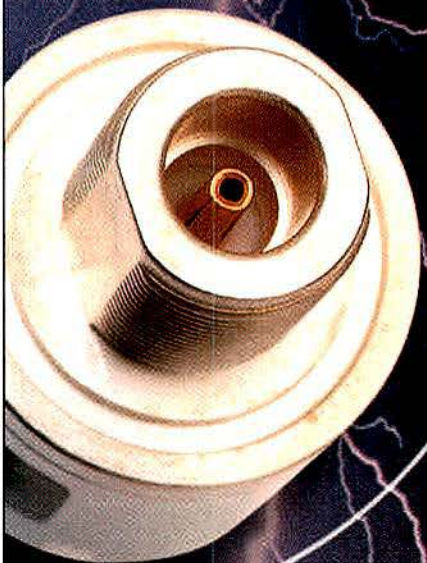
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on private spectrum—think again. The price per pop, or per megahertz (or per FCC auction employee) is coming down fast. The bloom is falling off the auction rose, and the FCC is getting less and less for each newly auctioned band. The recent location monitoring service (LMS) auction netted some bucks, but probably not nearly what the band would have been worth had it been auctioned about a year ago. And the equipment is available for construction. All I'm saying is, don't dismiss auction participation out of hand.

6. Speak out for what's morally right

CALLER: Dr. Robert, isn't it enough that I do the right thing, myself?

DR. ROBERT: The FCC is getting heat from a group of congressmen for its plans to auction private radio spectrum. The congressmen are directing the FCC to look for alternative methods for licensing private spectrum that do not involve auctions of wide-area systems. If you agree, don't sit back and hope your congressional offices get involved. Send a letter to your representatives and senators, urging them to join this effort. For more information, check with the Industrial Telecommunications Association (ITA) or Small Business in Telecommunications (SBT).

7. Get a ring and a date first

CALLER: This experienced ESMR has been pressuring me to make a date with it and swap channels. Dr. Robert, how can I tell if it's sincere?

DR. ROBERT: In a decision that can be summed up as "We don't wanna," The U.S. Court of Appeals denied an Emergency Motion for Stay filed by SBT to delay the 800MHz relocation process. SBT had asked the court to delay the process until the FCC had a chance to rule on the thousands of petitions for reconsideration to the auction itself. So, it looks like relocation is going to happen in one form or another.

To prepare for this eventuality, I suggest that you do two things. (1) Get a lawyer to ensure that your rights as an incumbent are honored. (2) Approach this matter like an arms-length contract negotiation. Just because the FCC and the courts have said that a relocation might occur does not mean that the EA licensee will have the channels, money or ability to cause the relocation to occur. By the way, if you get one of those nifty forms from Nextel that asks you all about your system, tell them you'll answer the questions pursuant to due diligence after a relocation is signed, not before.

8. Join a support group

CALLER: Dr. Robert, sometimes it seems like I'm all alone in the world. How

can my business keep fighting?

DR. ROBERT: If you are like a lot of the two-way shops, your profitability is up, but your avenues of opportunity are down because of spectrum scarcity. Although it behooves everyone to check the FCC database on a regular basis (to see who's coming on and who's falling off) to see if you can hit the window for filing for additional channels, that's not where it should end.

There are small concerns out there that have a few channels and would likely welcome a merger of spectrum to create a larger network. With a little creativity, a couple of shops can get together and pool their spectrum resources to gain greater coverage and channel depth. A word of caution—don't do the deal on a handshake, and make sure there is adequate accountability among the group.

9. Don't expect pizza from a taco stand

CALLER: It seems I'm always making the wrong choice when I'm picking equipment. Are there any good manufacturers left?

DR. ROBERT: I'm seeing a lot of claims in the marketplace regarding a variety of products that are intended to increase efficiency in operation of trunked channels. Before you buy, ask yourself some questions:

- ☐ Is the technology proven?
- ☐ Is it licensed to a number of suppliers that you trust, so that you aren't in a sole-source situation?
- ☐ How long will it take for me to make back the cost of conversion?
- ☐ Does installation of the equipment require me to gravitate to selling a service in a more competitive environment? In other words, look beyond the bells and whistles.

10. Have a plan and follow it

CALLER: Dr. Robert, sometimes my competitive situation changes, and I don't know how I got there.

DR. ROBERT: Remember, as you upgrade your system, you may be changing your products and services to place your business in direct competition with the largest carriers. Is this where you want to be? If it isn't, don't buy the equipment that will force your hand. Instead, look for equipment that allows your system to evolve practically, not change overnight.

Well, I could go on and on with helpful tips like "Don't wear white shoes after Labor Day, always wear clean underwear and never accept a blind date that's described as "a good conversationalist." But it's been two hours since lunch, and it's time for a long swim.

Now go take on the competition. ■

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Circle (18) on Fast Fact Card

Stealth patrolling Pacific Blue

By Michael J. Major and D. A. Keckler

Mobile radios have been used in patrol cruisers for about 60 years, but what about patrol applications that use *non-traditional* vehicles? Communication headsets, invaluable aids to tactical officers on foot ("Advances in Police Tactical Communications," *MRT*, May 1998), have applications for specialized ve-

Non-traditional patrol vehicles are an application especially suited to radio headsets

hicles as well. Here's how three California police agencies, patrolling different geographies in Santa Rosa and San Diego, use head-

American flyers

Four officers are on the Santa Rosa downtown enforcement team, which is designed to increase the visibility of law enforcement. The deployment of this unit varies, but it includes logging time on bicycles, and the bike riders always go in teams.

"In a patrol car, you can call in for backup, but on a bike patrol, you want the other officer right there," said Ken Kimari, a police officer for the Santa Rosa Police Department.

The bike officers usually ride 10 to 20 miles a day during a 10-hour shift. A lot of pedaling is involved, but a turbo boost on the bikes provides an electrical assist for quick acceleration when climbing hills or parking ramps, for riding against the wind or, at a time of pursuit, to allow the officer to get to the scene less winded.

The bikes allow the officers to patrol areas inaccessible to patrol cars. These include various downtown pedestrian parkways and overpasses, city parks, parking structures and the backs of businesses. The bike officers get through downtown traffic faster than police cars and much faster than foot officers. The bikes not only get into out-of-the-way places, with no motor noise, they get there quietly.

Headsets dovetail with this stealth approach by allowing an officer to communicate with the dispatcher while speaking quietly and receiving messages that no one else can hear.

Kimari said the headsets had allowed officers to covertly surprise many people committing crimes. "We've utilized these headsets on our bike patrol for our downtown enforcement team for about a year now

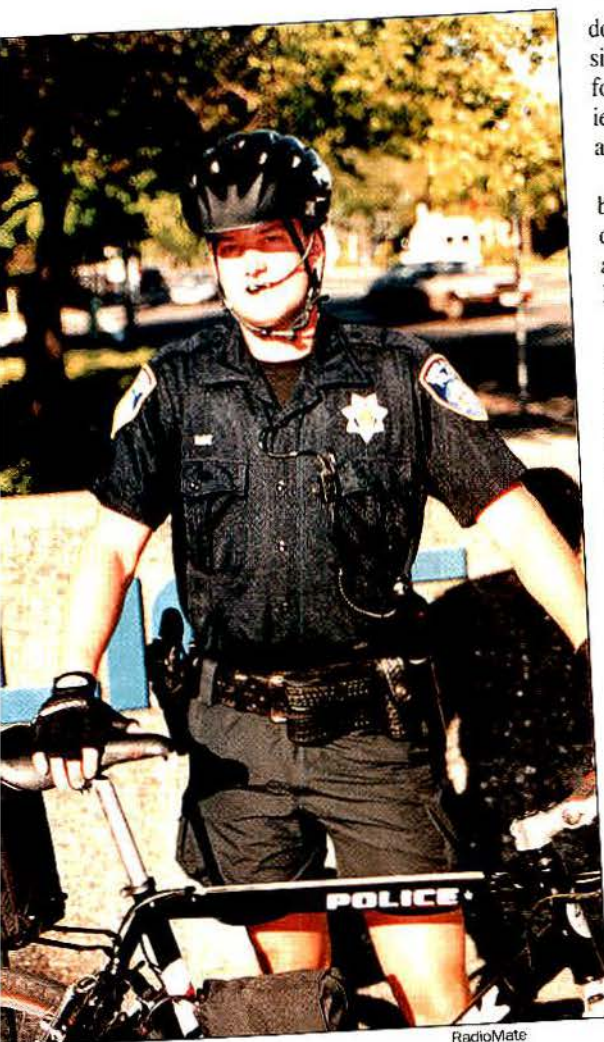
and have found them to be very effective," said Kimari.

The headsets, made by RadioMate, Concord, CA, consist of a boom microphone and earpiece connected to the side of a lightweight biker's helmet. The boom mic's advantage, Kimari said, is added safety for the officer because he doesn't have to take his eyes off traffic. Otherwise, he would have to drop his head to the side to speak into a shoulder radio.

The earpieces come in different sizes, molded for different ear shapes. "You get one that's comfortable for you, so you can wear it without strain all day long," Kimari said. "The department issues the headsets, and it's the responsibility of the individual officer to make sure they are maintained, but he keeps his own unit, which has been chosen for his comfort."

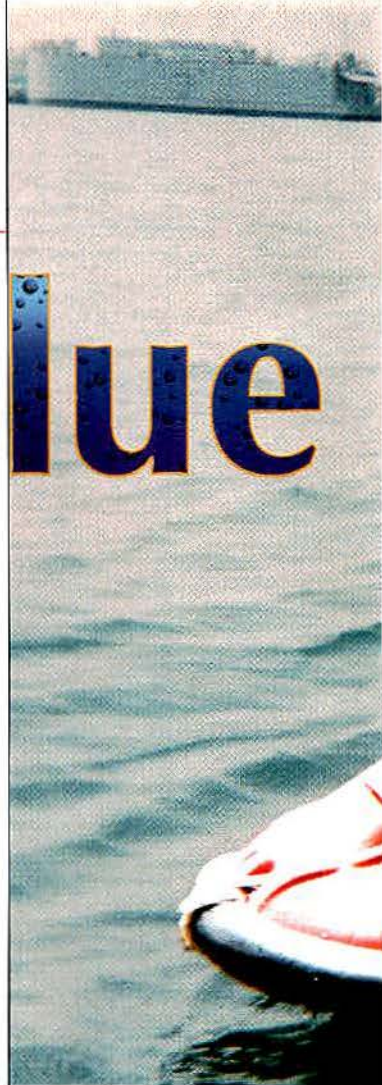
The officer is the only one who can hear the radio. "You can move stealthily and don't have to give yourself away," Kimari explained. "This is especially helpful in parking structures where radio echoes tend to give you away. And you can receive confidential information about the suspect without his even being aware."

Major is a communications writer in Anacortes, WA. Keckler is features editor.



RadioMate

hicles as well. Here's how three California police agencies, patrolling different geographies in Santa Rosa and San Diego, use head-





Port of San Diego Harbor Police

Opposite: Santa Rosa, CA, bike officers rely on headsets to stay in touch with dispatch. Above: SDHP has been using lightweight headsets for about nine months. Below: SDPD PWC officers keep their radios dry in watertight pouches.

The molded earpiece receives sound from a clear, low-visibility waveguide tube. Kimari prefers the molded piece because it allows ambient sounds, like traffic noises, to come through, which is another safety consideration.

The headset cord connects to an interface, about the size of a domino, that can clip wherever the officer wants, onto a belt, shirt or shoulder. This interface plugs into an adapter on a Motorola portable radio. The interface has a PTT button to allow the officer to key the radio. The manufacturer offers an optional PTT handlebar button, but Kimari said that whereas that might be helpful for officers on motorcycles, those on bikes tend to dismount frequently and need to keep all radio controls on their person.

Breaking for lunch can be an inconvenience because if an officer is called back to duty he has to reconnect his radio, put a jacket back on (if it's cool weather) then go out and unlock the bike.

Despite minor inconveniences, the bike, with the communication headset, is still the quickest and most efficient way to get to many emergency situations, Kimari said.

Baywatch

If radio communications can be problematic on bikes, they can be even more challenging on personal watercraft (PWC), also called jet water-skis. The San Diego Police Department uses Kawasaki 1100 STX PWCs to patrol the Mission Bay area.

A PWC rides like a motorcycle over the water, which is great for mobile transportation; but it also *sounds* like a motorcycle, at least when roaring through the waves. This makes normal radio communications impossible. Even with headsets, there are difficulties. The turbulence experienced when riding one of these watercycles can easily jar a microphone or receiver out of alignment. The radios also tend to get wet, rendering them useless.

Roger Barrett, an officer with the Mission Bay Harbor Patrol Division, solved these problems with ingenuity. When he couldn't find a headset designed specifically for his needs, he modified a department-issued Setcom headset. For starters, he removed the foam earpad and attached the earpiece permanently to the helmet.

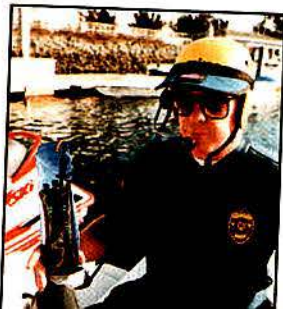
Previously, the Motorola Saber

portable radio, connected by wire to the headset, was carried in a jacket or hung on the handlebars of the watercraft, resulting in salt-water damage to the radio. To prevent this, Barrett put the radio in a commercially available waterproof bag, which is kept under the seat or in the dash storage compartment.

"It's really increased the usefulness of these watercraft," Barrett said of the headset use. "Before, we could be out enjoying ourselves, and be close to an emergency situation, but not hear a thing or have a clue as to what was going on."

Now the communication is not only excellent and protected, it is also hands-free. But what happens when the officer has to leave his craft, to either go ashore or aboard another boat?

"When you're in the elements, you're always getting sprayed, and we had no place to carry a gun on a wet suit," Barrett said. So he designed a wet suit with a shoulder holster and Velcro fasteners to keep the gun secure



Ron Barrett, SDPD

and dry, doing the same for his badge, and a pocket for the radio. So, if the officer has to leave his craft to board another boat, go ashore, or even jump into the water, he can still take the radio and can communicate.

The SDPD boat patrol started in 1985. The PWCs arrived in 1996. (The headsets were put into service in 1998.) PWCs have a dry weight of almost 600 pounds, and they take a bit of skill to navigate. With 120hp, they can move through the water as fast as 60mph. These watercraft are extremely fast and powerful, but they can also maneuver quietly and unnoticed in places where a larger boat could not. Once they make a stealth approach to a location and discover an illegal activity, they can call in larger boats for backup.

"We've been involved in boating accidents resulting in death, drunk boating accidents, smuggling—just about everything," Barrett said. "We also see things happening on land, such as car accidents, which we can call in."

The field of operations for the SDPD PWCs is not limited to the harbor. Barrett recalled a recent flooding in San Ysidro, south of San Diego, near the border. "My partner and I used these personal watercraft to patrol the streets that were six feet under, where the larger boats could not go," he said. "We were able to stop looting and rescue people who were sitting on their rooftops. We enjoyed that."

Down the coast

Just south of Mission Bay, San Diego Harbor Police (SDHP) provides vehicle patrol services, like a municipal police department, in and around the parks and tidelands areas of San Diego Bay. SDHP also has to manage what happens on the water. To further that mission, a PWC team was created in the summer of 1997.

Dave Fouser, senior police officer in charge of the Harbor Police Personal Water Craft Team, said that environmental concerns were one reason for creating the team.

"The South San Diego Bay has shallow-water areas, and our big boats, which are basically fire boats, top out at about 30mph and put out a hellacious wake," Fouser said. The area is environmentally sensitive for species of terns and green turtles. "For environmental purposes, that area, being as shallow as it is and not used [commercially], gets a lot of jet skiers and a lot of water skiers. People try to use that as a recreational park. The speed limit down there is 5mph, and prior to having the Jet Skis we were unable to enforce it."

"Now, having these [PWCs], they're fast enough that we can chase people down, stop them and advise them" both for education and enforcement, Fouser said.

The six-member team consists of four regular duty officers, including Fouser, and two alternates. "We have two

Kawasaki 1100 Jet Skis that we're using. We go out in pairs, and we're just basically working Fridays through Mondays on the Jet Skis. That's when the traffic is increasing," Fouser said.

The PWCs are used more as enforcement tools than as rescue tools. Fouser said a PWC may be suitable for activities like drug interdiction as far as stealth, but it is less than ideal for boarding a boat. "The platform is very unique and very difficult. It's a hands-on type of machine, and you run into specific problems when you're trying to pull alongside another boat," Fouser said. PWCs sit closer to the waterline, which can make it more difficult for an officer to get the drop on someone with his weapon. "I kind of liken it to being a motorcycle officer on the water," Fouser said.

Like motorcycle officers, the PWC team found safe and efficient communications to be a challenge. The PWC unit first used hand-held portables, which got soaked in the water environment. Not only was this expensive, but the portables were hard to hear and had a limited range. From the southernmost reaches of the bay, the dispatch centers are nearly 10 miles away.

SDHP's Shelter Island Harbor Police Communications Center is located at the extreme seaward end of Shelter Island, near the harbor entrance. A secondary dispatch location is situated at San Diego International

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Airport (Lindbergh Field).

After several experimental tries, the PWC unit, working with RadioMate, devised a system it could use. Rather than a portable, the unit's radios are the same Motorola ra-

dios used in the Harbor Police patrol cruisers, but mounted in a foam-padded, watertight storage compartment under the PWC seat.



The radio compartment is also the center of gravity for the craft, which minimizes vibration of the mobile radio when the craft is moving through rough breakers. A radio cable runs to the steering column, where a jack for the RadioMate headsets is located. A thumb-activated PTT switch, located next to the throttle handgrip, allowing an officer to key the radio and control the craft.

"The headsets had to be designed specific to our needs because they had to be water-resistant at least, if not waterproof," Fouser said. Although an officer may not have to become completely immersed in the water, there is plenty of spray breaking over the bow of the

ski. "We come back soaked," Fouser said.

An in-ear earpiece and boom mic attach to a headband. The SDHP officers generally wear police caps, rather than helmets, and a cap fits easily over the band, Fouser said. "Having the earpiece works really well because we can hear all the radio calls. Prior to this, we were missing a lot of calls," he said, because the radio speaker was being drowned out by ambient noise. Like Barrett, Fouser noted that the privacy afforded by the earpiece gives an officer covert dispatch information in the middle of a water "traffic stop," such as background information on prior convictions.

"In any application in law enforcement, the most important tool you have is your radio—even more than your weapon," Fouser said.

The PWCs are clearly marked "harbor police" in large lettering, and the officers all wear uniform-style wetsuits with departmental patches. The signage and radio antenna are the only things distinguishing the police vehicles from pleasure craft, but this can be an advantage.

"A lot of times, when we're going after someone who's in violation, that we see skiing back and forth, they don't realize who we are until we're right on them," Fouser said.

The program has been "a learning experience," Fouser said, requiring the hammering out of proper uniform and procedures details. The headset piece of the PWC team equipment puzzle was put into place in the summer of 1998.

"Our biggest hurdle was the radio communications," he said. "We had everything resolved up to that point, until we got hold of RadioMate. They resolved this problem for us, and now we're fully functional."

In addition to enforcement, the SDHP PWC team has undergone some limited rescue training, which has been particularly beneficial when combating the effects of El Niño in Southern California, Fouser said. The Tijuana River along the U.S.-Mexico border is subject to flooding, which can cut people off from supplies, which previously had to be airlifted to those stranded by the rising water. PWCs can effectively fill this role in white water rescue, Fouser said, and headsets make that job easier as well. "There again, when you're in a situation where you have rough water, you can't just take your hands off the handlebars to key the mic," he said. "We can be running 60mph and still have communication with our dispatcher."

Summary

Public safety officers continue to face different environments. They must go wherever the felons go and wherever the people they've sworn to protect go. Small, personal vehicles help them to get there. Personal, portable communications systems ensure that wherever the pursuit takes them, they don't go there alone but with real-time support. ■



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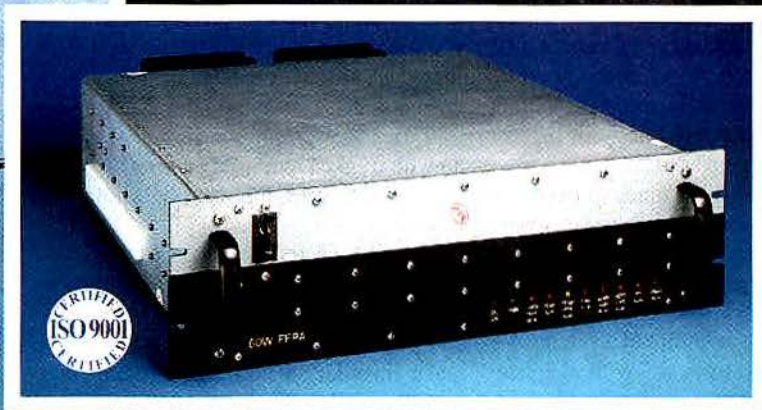
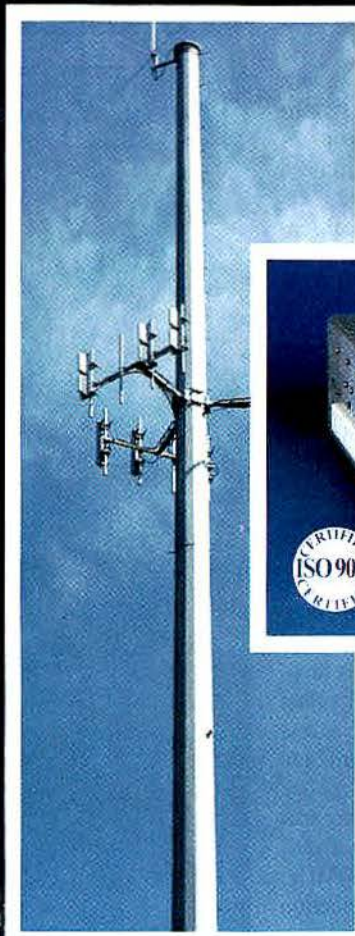
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You don't have to be big to trunk

Some small-town public safety agencies and small businesses believe trunking means 'big system.' Single-site trunked systems can offer advantages over conventional networks for small to mid-size service providers and dedicated systems.



By Asif Malik

Trunked 800MHz radio systems are often perceived as two-way communications possibilities only for entities with a large number of users. Unless a system uses at least three channels and a few hundred or more users, many believe that digital trunking is just not prudent in terms of cost and complexity. But do users really need to face high costs and confusing technology decisions with a trunked system? No.

As system capacity becomes constrained while communications needs increase, many smaller public safety agencies, public works units and business and industrial radio communications users are thinking about switching from conventional systems to single-site 800MHz trunking. With adequate planning and training, small to mid-sized conventional radio users—as well as businesses, utilities and agencies that have never used private radio—can make a successful transition to a single-site trunked system.

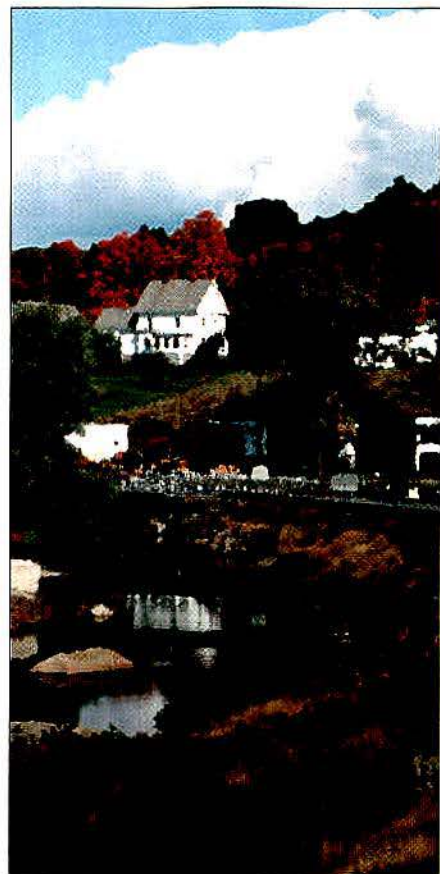
Initial considerations

Leading advocacies for 800MHz trunking are to increase channel capacity, improve the level of privacy and exert more control over the radio system. Operators of conventional radio systems who want to expand the number of users struggle because their channels are near ca-

capacity. They begin to look at trunking as a viable option because it supports significantly more users per channel than conventional radio. In some instances, a trunked system can support up to 300% more users over the same coverage area as a conventional system. Lack of privacy limits conventional systems when frequencies are shared by different groups of users. Also, operators don't have the same control over *who* uses the system—and *when*—as they do with trunked radio. When limitations become severe, operators consider moving to trunking.

As radio users investigate trunked systems, they sometimes are overwhelmed by the technology. Advanced features, more components and sophisticated software make installation and maintenance more complex and costly than with conventional radio. However, the increase in cost is justified by such features as group and individual calls, emergency calls, fast channel access and failsoft trunking. Advanced systems add remote programming capabilities, telephone interconnect, activity logging and other features. Trunked systems also come in a variety of frequencies—800MHz, 900MHz, VHF and UHF bands—making selection more difficult.

Aside from these considerations, radio users face other decisions: How complex of a system do we need? Should it be configured for wideband (25kHz) or narrowband (12.5kHz)? What hierarchies do we set up for subfleets and fleets?



Making the move

The move from conventional to trunked is made less challenging when the buyer, working in conjunction with the radio distributor or reseller, selects a system that can meet his needs but doesn't contain a great

Asif Malik is product manager for trunked radio systems at Ericsson Private Radio Systems, Lynchburg, Va.

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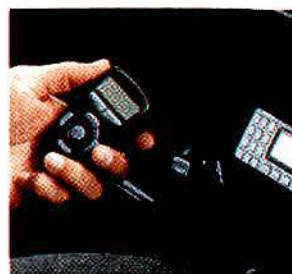
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deal of complexity.

Smaller operators (defined as 100 to 600 radio users) now have more to choose from in entry-level trunked systems, which do not have the rich feature set found in bigger trunked radio networks. Manufacturers and dealers are developing systems that allow smaller customers on a limited budget to take advantage of trunking technology. Customers can simplify their choices by selecting a system that contains a pre-configured package of standard features necessary to operate a successful trunked network. The alternative—picking and choosing from a

large menu of options—can make system selection and installation more complex than is necessary.

Public safety agencies, public works departments, utilities, businesses and others shopping for an 800MHz trunked radio system should look for a feature package that contains all the core benefits of trunking: fast access, emergency call and system redundancy.

► **Fast access**—Fast channel access time contributes to system efficiency and is one of the biggest advantages over conventional radio. In any trunked system, the time be-

tween pushing the talk button and getting an available channel should be less than half a second. High-speed digital signaling over the control channel in 800MHz systems virtually eliminates delay in obtaining a channel assignment.

► **Emergency response**—The ability to handle emergency calls quickly and efficiently is another key to trunked systems, particularly for public safety and law enforcement applications. When the user initiates a call with the emergency button on his radio, the request is assigned immediately to a free channel, and if all channels are busy, it goes to the top of the queue. Emergency group notification alerts all users in the group of the emergency request.

► **Redundancy**—Trunked systems differ in their redundancy, or ability to continue operating in the event of a failure in any part of the system. Some continue to operate in trunking mode, even if the site controller or several repeaters go down. Others revert to conventional mode if a controller fails. Radio operators looking for an 800MHz trunked system should consider redundancy factors.

System capabilities and features represent only part of the equation in selecting and installing the right basic trunked system. Smaller customers, who might not have the time, budget or technical resources to handle each phase of system design and purchase without assistance, can call on consultants, dealers and manufacturers for help. Particularly, dealers who have undergone training and certification from the manufacturers of the systems they sell can be an invaluable source of information for customers purchasing and installing a trunked radio system for the first time.

Getting up and running

After the system is selected, propagation engineering studies must be undertaken to help make channel usage as efficient as possible. As with any radio communications system, *coverage* is the highest priority. Conventional radio operators converting to trunked, as well as customers installing their first system, should take advantage of computer-aided RF propagation analysis to plan the best possible radio coverage.

The next key consideration is tower site selection. With the entire system covered from one tower site, the location of that site is crucial. Several software packages for modeling radio signals are available to predict system coverage and signal strength from each of the proposed tower sites.

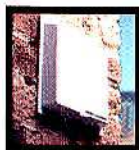
Once the site is selected, the dealer and the manufacturer must complete the installation, which can be done in a week for some single-site 800MHz systems. Testing and training are the final phases before the

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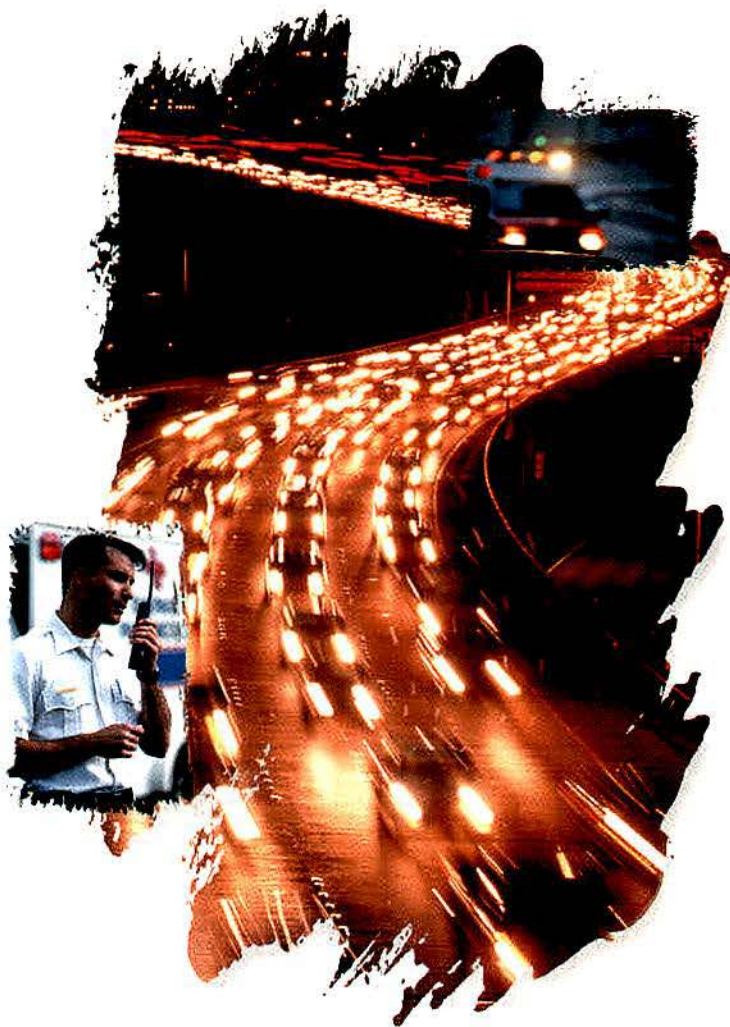
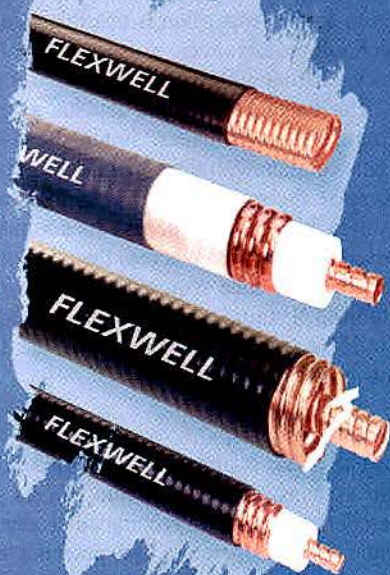


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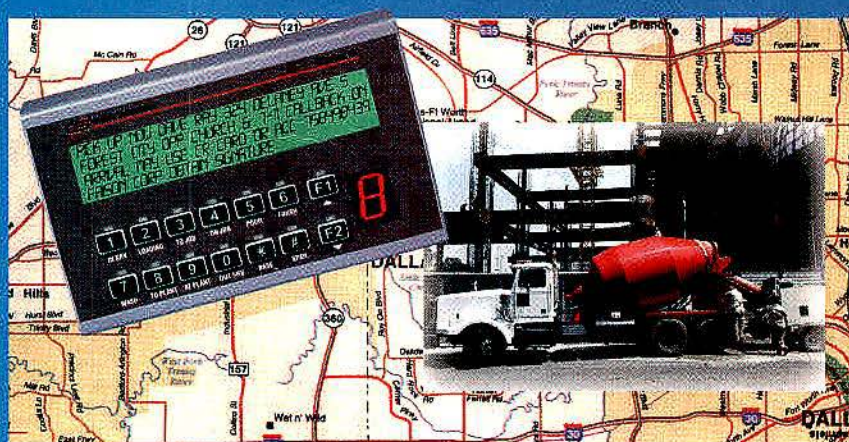


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operator is ready to begin using the new system. Users new to trunking often have to adjust to differences between the two types of radio systems. When the user pushes his talk button, for instance, he must get accustomed to listening for the tone that indicates that a channel is ready.

Various levels of operational support are available from dealers and manufacturers, ranging from basic maintenance, which provides repairs on equipment and technical support over the phone, to a full level of on-site support for customers with large networks requiring extremely short response time.

Smaller customers—even those new to trunking—aren't likely to need the highest levels of maintenance, but they should consider a basic maintenance contract to take advantage of the expertise available from the manufacturer.

Satisfaction with the choice

Customers using an 800MHz trunked system for the first time should experience immediate improvements in channel capacity and efficiency. As communications needs grow, system expansion is possible. And as technology advances, software upgrades keep existing 800MHz systems up to date.

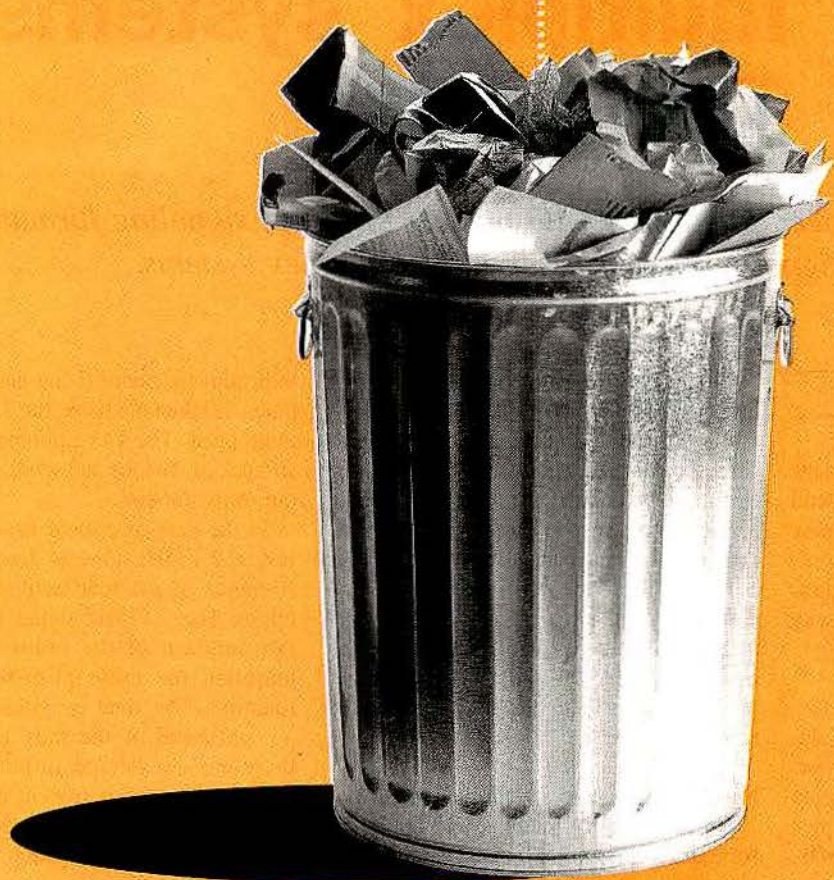
The demand for mobile data has also increased among smaller, single-site users. Data communications capabilities greatly increase the usefulness of a trunked radio system by allowing access to computer-based applications. Whereas the addition of mobile data once required expensive new studies, planning and equipment, modern 800MHz trunked systems make the task much more manageable.

Help is available

The major manufacturers of trunked radio systems, as well as radio dealers and resellers, are eager to accommodate smaller radio system operators and potential new customers who previously thought a trunked system was beyond their reach. Last year, for example, Ericsson Private Radio Systems introduced its EDACS Connect system to enable conventional users to migrate to trunking more easily than if they purchased an EDACS system with a full feature set. EDACS Connect was introduced in the 800MHz band to take full advantage of digital communications technology.

New and smaller radio customers no longer have reasons to feel shut out of the advancing wave of radio communications. As frequency issues become more difficult to deal with, the lure of trunked radio and its inherent efficiencies becomes greater. Fortunately for radio customers, the process of moving to trunking these days is easier than ever. ■

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Analog multiplex systems: The basics

Part 2 — Technicians need familiarity with modem circuitry, signaling formats and proper signal levels when servicing multiplex systems.

By Jeff Ashley

Today's two-way radio field technicians have increased responsibilities that extend to maintenance and installation of multiplex equipment. As such, they encounter terminology and a variety of circuit configurations that are foreign to the two-way industry.

Four-wire & two-wire circuits

Most communications circuits are designed to send *and* receive information, often at the same time. Analog multiplex (mux) systems accomplish this full-duplex operation through use of a *four-wire* (4W) mux modem. The modem has separate transmit and receive circuitry, providing isolation between the two. The term *4W* comes from the number of VF wire connections made to the mux channel modem. Because the MOD and DMOD are balanced connections, each requires two wires, totaling four, hence the term *4W*. (See Figure 1 below.)

Ashley is a communications technician in Los Angeles.

In the case of a telephone instrument or other *two-wire* (2W) device, the transmit and receive signals are carried on a single, balanced pair of wires. A 2W circuit must be converted to 4W when being applied to a transport system having separate receive and transmit circuitry. This conversion is accomplished through a 2W/4W hybrid circuit that is a three-port transformer arrangement. The telephone connects to the 2W port, while the mux modem connects to the 4W receive and transmit ports.

Signaling—in-band & out-of-band

Circuits usually require supervisory information (*signaling*) to be transmitted along with VF. The two basic signaling types used in frequency-division multiplexing (FDM) systems are *in-band* and *out-of-band* signaling.

In-band signaling occurs when supervisory information is sent within the normal 300Hz to 3,400Hz circuit passband. Using a subscriber telephone circuit as an example, a 2,600Hz tone can be sent from the far-end mux channel to the central office (CO),

indicating the phone is "on-hook." When the phone is taken off-hook, the 2,600Hz signal is dropped. The CO equipment senses the absence of the tone and sends dial tone back out to the far-end.

In the case of remote base station keying, a 2,175Hz tone is frequently used. Presence of the tone activates the transmitter. The 2,175Hz signal is present for the duration of the radio broadcast to maintain the radio push-to-talk (PTT) function. The tone is within the normal VF passband of the mux circuit and is therefore considered in-band signaling. Because the tone is present during the entire broadcast, the tone must be notched out prior to the base station exciter stage, or it will be transmitted out over-the-air along with the voice.

Out-of-band signaling is achieved by moving the signaling tone frequency outside the 300Hz to 3,400Hz VF passband (but still within the 4kHz channel slot). A common example of this is the use of a 3,825Hz signaling tone.

Out-of-band signaling can also be accomplished by re-insertion of the suppressed

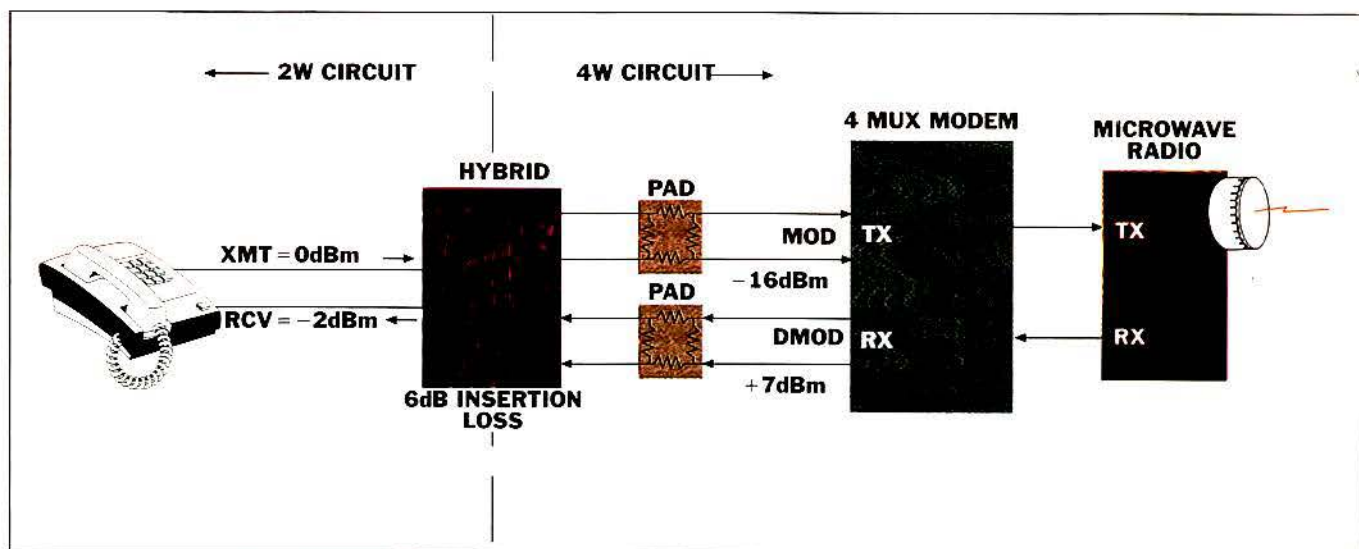


Figure 1. 2W/4W hybrid. (Signaling circuitry is not shown.)

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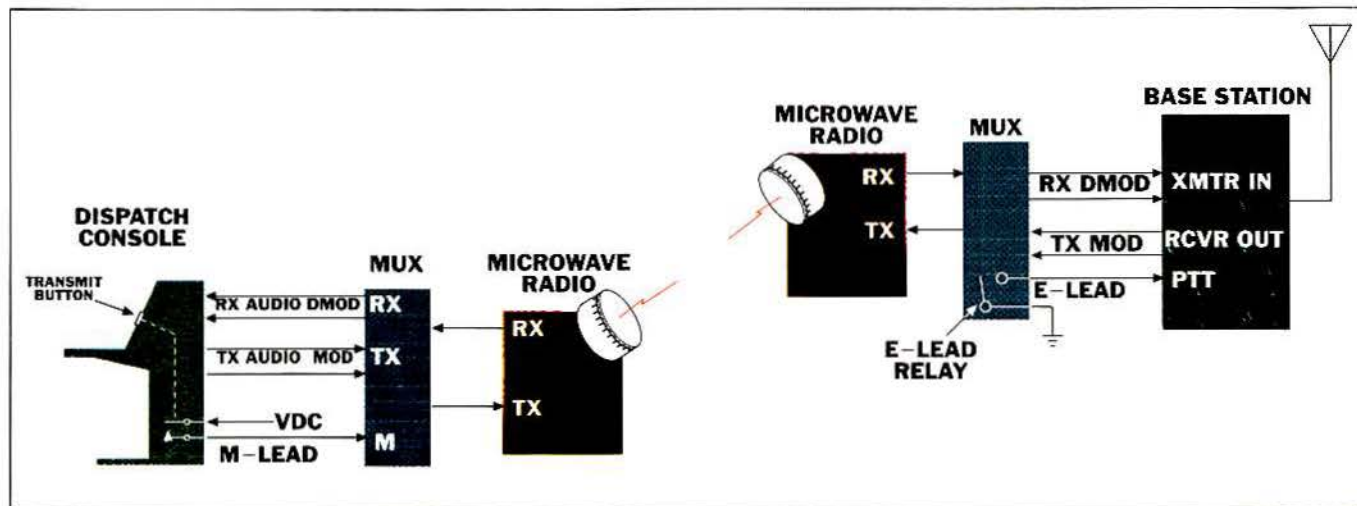


Figure 2. E-lead and M-lead signaling

carrier from the mux modem's first balanced modulator stage. Raising and dropping the level of the suppressed carrier on one end of the circuit can activate and de-activate signaling functions on the far-end. In this case, the signaling frequency will be located on the extreme edge of the allotted 4kHz channel slot.

Carrier leak is a term relating to the amount of residual suppressed carrier left in the mux modem transmit signal when the suppressed carrier level has not been raised

for signaling. Since this carrier level can be detected and used in the signaling scheme, it is important to keep it suppressed as much as possible to prevent "falsing" when signaling is not activated. Often, the mux channel modem will have an adjustment for minimizing carrier leak when signaling is not activated.

Signaling—E- & M-leads

The mux modem connections that relate to signaling are the *E-* & *M-leads*. The *E-*

lead connection is dedicated for receive signaling use, while the *M-lead* is for transmit.

Typically, the mux modem transmits signaling to the far-end when a voltage is applied to its *M-lead* connection. The far-end modem detects the signaling and activates its *E-lead*. Usually, the mux modem is equipped with an *E-lead* relay that supplies external supervisory equipment with a dry set of relay contacts.

Figure 2 above offers an example of *E* & *M* signaling. A radio dispatch console

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is connected to mux so that when the console operator wishes to key up a hilltop transmitter, a button on the console is pressed. This applies a voltage to the mux channel M-lead connection, causing the modem to send M-lead signaling out to the hilltop mux via microwave. The coordinate mux modem on the hilltop detects the M-lead signal and energizes its E-lead relay. The E-lead relay contacts close and apply a ground to the radio PTT line. The hilltop base station keys up, and the dispatcher can make the broadcast.

VF transmission levels

It is important to maintain proper

signal levels within an analog multiplex system. The term *test tone level (TTL)* describes the maximum signal level that should exist at any point within an analog mux circuit to avoid creating intermodulation distortion components throughout the baseband. Test tone level is sometimes also referred to as *test level point (TLP)*.

Levels of "live traffic" can fluctuate greatly, depending on the circuit application. For this reason, they are not often a useful reference when making critical circuit level measurements and adjustments. Instead, maintenance personnel must inject an

external, constant-level test tone (typically, 1,004Hz) into the circuit. However, this is an intrusive method that disrupts normal circuit operations. As circuit gain and loss tests are performed, levels exceeding expected values are referred to as *hot*, while those which are low are referred to as either *low*, *cold* or *long*.

As shown in Figure 1, TTL for a 2W circuit in the transmit direction is 0dBm, which produces a -16dBm level at the mux MOD. If +7dBm is delivered from the mux DMOD, it should produce a receive level of -2dBm on the 2W side of the hybrid. The standard test tone level for a 4W channel modem is -16dBm into the MOD and +7dBm out of the DMOD.

In transmission systems, the term *dBm0* is frequently used to refer to the difference (in decibels) between TTL and the absolute level (in decibels relative to 1mW) being measured. For example, if a base station status tone that has an absolute level of -26dBm is applied to the MOD of a mux channel, the level is said to be "-10dBm0" at that point in the circuit. Another way to express this is to say the level at the MOD is "10dB below test tone level." Assuming proper system alignment, this status tone will come out of the far-end mux DMOD at the same -10dBm0 level. Since TTL at the DMOD is always +7dBm, the absolute level (in dBm) of the status tone can be calculated: +7dBm - 10dB = -3dBm. Even though the absolute input and outputs levels of the MOD and DMOD are different (-26dBm vs. -3dBm) they both retain the same *reference* to test tone level (-10dBm0). For this reason, the term *dBm0* is handy to use.

The third and final part of this series will consider VF and HF connections to analog mux systems, as well as typical test equipment found in the analog transmission systems environment.

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Analog multiplexing series

This is part of a three-part series on analog multiplex systems.

Part 1: "Analog Multiplex Systems: The Basics," April 1999.

Part 2: "Analog Multiplex Systems: The Basics," May 1999.

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UTILITY COMMUNICATIONS: MATCHING TECHNOLOGY TO NEEDS



Business, utility and industrial radio users like to control their own communications networks. While the traditional SMRs grapple with expanding services and new technology, the large, industrial end-users often have creative applications for their private networks.

By Ernest Worthman

Industrial users rarely make the headlines in two-way news. Most of them have a high comfort level with this industry and know the equipment and technology well. They have been using two-way radio for years and find it an excellent private communications system. Often their service areas cross city, county and even state boundaries, and they may have hundreds of thousands of users. Industrial users are also an economic force to reckon with for both manufacturers and resellers.

This article takes a look at what one of the nation's largest utilities, a statewide provider of electrical power, is doing with two-way radio and peripheral technologies.

Peeling back the covers

Voice and SCADA (supervisory control and data acquisition) figure prominently in this utility's communications applications. Utilities, in general, need automatic monitoring of sites such as power plants, pipelines and distribution centers. SCADA uses radio frequencies for such monitoring.

This utility uses conventional and trunked two-way radio for communications and specialty applications. (See Table 1 on page

Worthman is contributing editor.

44.) Its network is typical, providing wide-area coverage for mobile-to-mobile and mobile-to-base communications. Most of the utility's voice communications are open channel, with privacy sacrificed for wide-scale operability.

Because the utility serves a large area, its radio system has more than 70 repeaters and 2,000 to 3,000 mobiles. VHF frequencies are used because their propagation characteristics fit diverse topography. VHF also has superior range, helping to keep the number of necessary repeater sites to a minimum.

Diversity—Not just for reception

The utility uses a mix of mobile radio types. Some users need voice only, some need data, some require security and still others need multiple-frequency agility. Power of mobile units also varies greatly. In some regions, 25W mobiles work fine; in other areas, 100W mobiles are needed. When the utility went to bid last time, it discovered that no manufacturer offered radios with all of the desired features to replace its aging GE Delta units.

During the last round of upgrades, the utility wrote RFB specifications and invited all manufacturers to bid. The mobile specification included functions such as large channel capacity, alphanumeric display and a wide

operating frequency range (5MHz to 6MHz) because the repeaters are "wideband." Most large manufacturers came back with mobiles matching part of the spec, but none could meet all of the requirements. The two major bid winners were Motorola, with the Spectra line for high-power installations, and Kenwood Communications, with its TK line for the low-powered mobiles. Shortly after the bid was awarded, Motorola discontinued its Spectra line, and the order was replaced with Kenwood radios. Today, almost all mobility units used by the utility are Kenwood.

Next, the utility looked at repeaters' upgrades. Most of the original repeaters were GE Mastr II series with a broadband (5MHz) front end. Fortunately, these repeaters were capable of being upgraded to the Mastr II-E status by replacing the current component shelf with an aftermarket shelf and by installing a wiring harness from IDE. The decision to upgrade was approved, at a cost of about \$2,000 per repeater. This gave extended life to an existing system, whereas total replacement would surely have been more costly.

Future communications

Most large private land mobile radio (PLMR) users, such as utilities, industrial companies and other businesses, make changes in phases, and this utility is no exception. Its "drawing board" pictures a lot for



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A must requirement for future equipment is security. This utility doesn't have any security on its radio channels, not even tone signaling. This is about to change.

Utility field workers sometimes collect money from customers. With unsecured communications, anyone with a radio can listen in when amounts, credit card or account numbers are communicated to the office, possibly compromising both the customer and the employee. The current procedure to work around this is to use in-house codes over unsecured communications channels (much like the police "10-codes") to relay instruc-

tions. At a minimum, this keeps radio listeners from knowing what is going on and can be relatively effective as long as the situation isn't too complex.

Typically, such security-sensitive situations involve non-payment or late payment of utility bills, resulting in a shutoff being imminent or just completed. In these circumstances, customers often want to pay the shortage immediately. For any number of circumstances, it may not be practical for the customer to do so, especially in rural locations. So, it becomes an issue of getting the money and restoring service as soon possible.

When service is terminated, the utility dispatches an employee to the customer's location. Once the money changes hands, the service technician restores service and reports back to the base. Sometimes the employee may be carrying several hundred dollars, after completing several such jobs.

Obviously, secured transmissions (or mobile data) are necessary. The utility is also sensitive to other situations (leaks or fires) that need to be kept confidential.

This forward-thinking utility is also grappling with the eventual implementation of narrowbanding in the bands traditionally used by utilities. This will have an effect on the current infrastructures, especially the repeaters.

This utility foresees VHF and UHF trunking as a possible technology to boost the capacity of some of its conventional channels in more populous areas in the near future.

In the more distant future, the utility foresees using a yet-to-be-defined "digital stream" to carry its diverse communications including voice, data and control. Whether this digital stream will be part of the utility's own system, part of a common carrier or a satellite system, is unclear to the utility's managers.

Mobile data

The utility has been testing how effectively mobile data equipment and software can be used for control instead of communications. If it works well, the company may integrate mobile data with automatic meter connects and disconnects. With mobile data, service connects and disconnects could be handled differently than before.

As the service technician starts the day, data would already be downloaded to the service vehicle's data terminal. The service technician would have all of the information necessary: the amount, the customer ID and the service required. Once the job is done, information would be sent back to the base, updating the records—all without a single transmission over voice channels. The service technician would collect the money and then, using mobile data technology, reconnect the service electronically. Furthermore, such jobs could be done on a real-time basis, throughout the day as well, without compromising either the utility or the customer. In the future, the service technician may even electronically transfer the customer's funds.

Although mobile data has many applications, for this utility, customer service would be the first step. As software and hardware continue to mature, mobile data could eventually be used to control any number of power functions, such as grid manipulations, load balancing, switching pumps and bringing motors on line. Other future mobile data functions include automated maintenance

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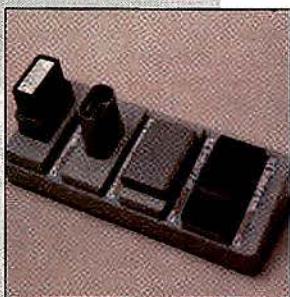
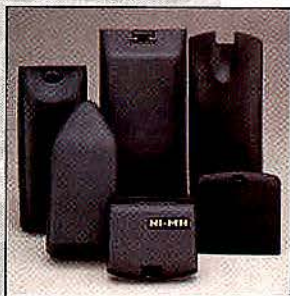
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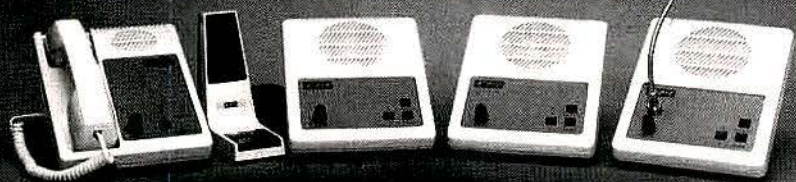
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Table 1. Use of various frequencies and manufacturers' equipment for power production, transmission and distribution applications.

FREQUENCY	BRAND	PURPOSE
HF	Motorola	Used for limited communication between our dispatch centers in Wyoming, Utah and Oregon, and our major steam plants through our system. With this limited ability, employees can start to put plants and generators back on line and bring the power grid back up. This is designed to be used in a total "black" condition.
VHF highband	Motorola, G.E./Ericsson, Kenwood, Yaesu/Vertex and other assorted brands	The VHF frequencies carry the major communication for running day-to-day operations. They are used truck-to-truck and truck-to-office (dispatch). We are in the process of finishing a conversion from base station operations to repeater operations. There is some controlling done on VHF frequencies. The major operation is customer load control for load shedding.
UHF band	Motorola, G.E./Ericsson, Kenwood, Yaesu/Vertex and other assorted brands	The UHF frequencies are used for repeater operations in the various plants throughout the company. The frequencies are reused at each of the plants in an attempt to conserve frequencies. Many point-to-point links are also done in the UHF band. UHF frequencies were used for our first SCADA system. In response to the FCC rule changes, we are migrating from the UHF systems to 900MHz systems.
900MHz (future SCADA)	Motorola (some others, to a small degree)	As it became available, we used the frequencies set aside for multiple-address system (MAS) as the FCC set them aside. These systems give us control and display status of our lower-voltage substations. They are not used for any type of line protection.
Microwave bands: 960MHz, 2GHz, 6GHz, and as high as 14GHz	NEC, Farinon, Motorola, Harris and others. (At one point in time, every major manufacturer.)	The microwave systems' first and major use is to provide a path to carry protective schemes and systems for the protection of the high-voltage lines that make up the major power grid, the backbone of the system. As secondary functions, they also carry data, voice circuits, load control and alarms, and controls of the major substations and generation plants. They are also the major points where we interface communications with other power companies.

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For now, some of this is done with SCADA, but SCADA is not as dynamic as mobile data, nor does it have the ability to cross platforms as easily. SCADA systems are mostly self-contained, using dedicated hardware and frequencies, so moving the function to another frequency band and technology requires replacing sensor transmitters and antennas. In many cases, mobile data can be added to existing networks. This utility envisions mobile data, in part, as either an adjunct or a potential solution to SCADA's limitations.

Welcome to the 21st century

There are issues other than computer date interpolation that must be addressed in the next century. For this utility, visions include systems that can handle both voice and data simultaneously (referred to as SVD), integrated AM/FM digital radios and bringing power line carrier (PLC) control over to a digital platform.

But perhaps the most forward-thinking comment from this utility involves, in the not too distant future, the convergence of voice, data, SCADA, PLC and control in a small, hand-held PC (HPC) format. The system will be platform-independent and won't matter which type of communication the user initiates. The system's artificial intelligence will take care of details.

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Intrinsically safe radios: What you should know

Industrial environments where combustible materials are used or created by a manufacturing process, and hazmat situations encountered during fire and rescue calls, require a radio that won't become an ignition source. How can you be sure that's what you have?

By Donald E. Koehler

I have often been asked in my many years as a radio technician about the qualifications of the "intrinsically safe" radio. What makes a radio *intrinsically* safe? Who tests and certifies this type of equipment? Where is it used and required? Is it possible to rent these types of radios? Can an intrinsically safe radio be repaired legally? This article answers all of these questions and examines some additional circumstances when an intrinsically safe radio is required and where it *won't* help. The sidebar on page 50 provides Internet addresses for responsible agencies and regulations.

A volatile working environment really is a matter of life and death, so if you even *think* you *might* have to deal with intrinsically safe equipment, please read and study this information and follow up with a survey of your radio applications.

Let's begin with the idea of "intrinsically safe," as applied to electrical equipment. Many people mistakenly interchange the terms "intrinsically safe" and "explosion-proof." These are different classifications, using different standards

and engineering methodologies. *Explosion-proof* (or flame-proof) implies a containment system or a sealed box. Drawing from 30 CFR Part 18, Section 504 of the National Electric Code and National Fire Protection Association Part 70, *intrinsically safe* equipment can generally be defined as:

... equipment and wiring which is incapable of releasing sufficient electrical or thermal energy under normal or abnormal conditions to cause ignition of a specific hazardous atmospheric mixture in its most easily ignited concentration.

Note the term, "energy." Levels for temperature, voltage, current and energy storage, in joules, are well-defined as part of the testing and certification process. So, an intrinsically safe radio has either low-energy circuits, barriers to guard against ignition or both.

An intrinsically safe radio must pass a series of tests as a prototype. It is tested again as a post-production item, and it is clearly marked as "intrinsically safe." Certification of equipment is an expensive process, and the tests deal with specific

hazardous conditions. These hazardous designations come in a seemingly bewildering array of classes, divisions, groups and zones. Simply put, a "hazardous area" may contain: flammable or combustible gases or vapors; combustible dusts; and ignitable fibers or flyings (lint).

Specific classifications

- ❑ Class I, Division 1 denotes a location where ignitable concentrations of flammable gases, vapors or liquids exist normally. For example, this would apply to a refinery unit undergoing a refit or experiencing a fuel spill.
- ❑ Class I, Division 2 denotes a location where volatile flammable liquids or flammable gases or vapors exist but are normally inside closed containers.

Table 1. Standards authorities, by country.

COUNTRY	AGENCY
Belgium	INEX
Canada	CSA
France	LCIE
Great Britain	BASEEFA
Germany	PTB
Italy	CESI
USA	FM, UL

Contributing Editor Koehler has more than 30 years experience in radio, telephony and computer electronics. He has been teaching part-time at the University of Alaska, Anchorage, for the last four years. His email address is afdek@uaa.alaska.edu.

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Production areas in a manufacturing plant are a typical case.

- ❑ Class I, Zone 0 denotes a location where ignitable concentrations of flammable gases, vapors or liquids are present all or most of the time.
- ❑ Class I, Zone 2 denotes a location where ignitable concentrations of flammable gases, vapors or liquids don't normally exist, or if they do exist, only for a short time.
- ❑ Class II, Division 1 deals with ignitable concentrations of combustible dust that can exist in the air under normal operating conditions.

❑ Class II, Division 2 deals with combustible dust that is not normally in the air in ignitable concentrations.

❑ Class III, Division 1 deals with easily ignitable fibers or environments where materials producing combustible flyings (lint) are handled, manufactured or used.

❑ Class III, Division 2 deals with locations where easily ignitable fibers are stored or handled.

(This is a simplified breakdown. Refer to NFPA 70, the National Electrical Code or other appropriate standards for complete details.)

Different systems are used in Europe and

the United States to classify the type of hazard and whether the hazard is always present or present only in an emergency condition, such as a spill. The explanation of classifications given above is generic. You must consult the proper regulations for exact guidance. If you deal with radios in any of these environments, this type of documentation is a "must" investment. If in doubt, you can consult with a safety professional, equipment manufacturer, local fire department or hazmat regulator.

Compliance *standards* for equipment used in hazardous areas are set by *governments*. Many agencies, companies and organizations *certify* equipment for use in flammable, explosive, hazardous or restricted areas. In the United States, the U.S. Factory Mutual Research Agency (FM), a testing and insurance firm, certifies radios, as does Underwriters Laboratory (UL). Other certification organizations are given in Table 1 on page 46.

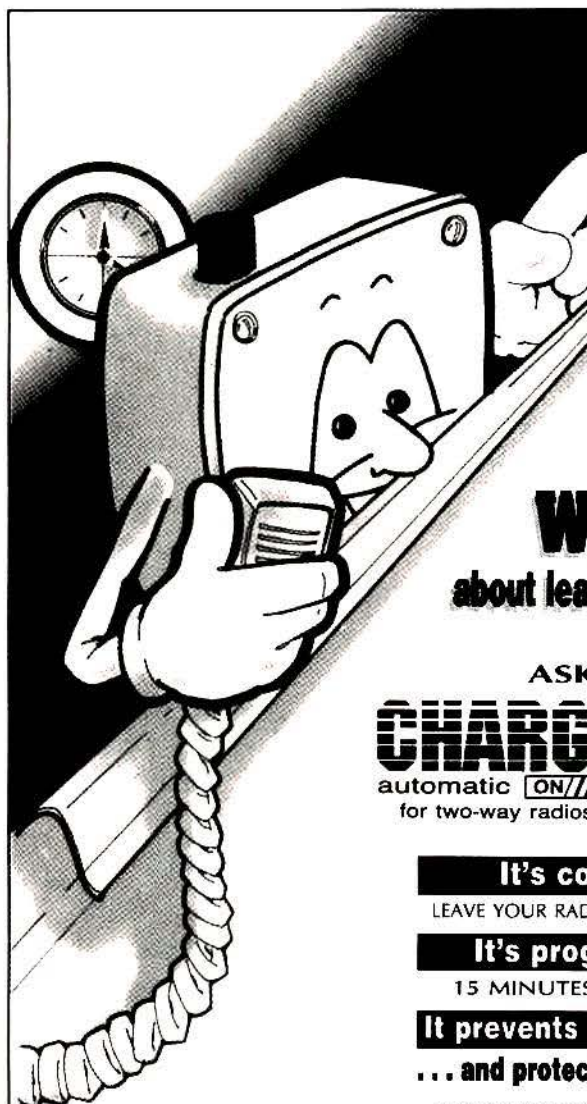
Note that each country has its own standards, so certification in one country is not proof of approval or certification in the United States. Always check before purchasing or renting radio equipment, including *test devices* to be used in a dangerous environment, that the certification of the equipment meets your specific requirements.

It is possible, even quite simple, to rent or lease intrinsically safe radios by the day, week or month. One important point to remember is that *all* accessories, such as batteries, speaker-mics or headsets, must also carry an intrinsically safe marking from an appropriate agency. *If you use uncertified accessories, you do not have an intrinsically safe radio system.* Intrinsically safe batteries usually cost more than batteries that fit the regular service series of the radio. It is not about cost, it's about *worker safety*.

Repair requirements

I am often asked, "Can I repair an intrinsically safe radio at my shop? Do I have to have a government license?" The safest, responsible course is to contact the certifying agency or the manufacturer for these details. Some equipment types *do* require special training from the factory for proper maintenance of the radio sets. Most intrinsically safe radios also require periodic inspections and maintenance to retain their rating. The certifying agency, such as FM or UL, will have the final say about repairs. I am not aware of any Government license requirements for intrinsically safe equipment repair activities in the United States.

An additional clarification of a common question: Why don't you see large quantities of mobile radio sets being certified? The vehicles they would go into, usually gasoline-powered, preclude the rating. There are too many ignition point sources. One possible exception would be mobiles used on diesel-powered refueling trucks.



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RF ignition

Intrinsically safe radios are not a guarantee of safety in every workplace. In many hazardous areas, the *RF emission* produced by the radio set is the danger. Use of a radio transmitter around explosives, squibs and

electro-explosive devices (EEDs) is usually banned. In these situations, intrinsically safe certification is irrelevant; measured level of RF is the key factor. You must be able to calculate power densities in watts per square meter (W/m^2) for your equipment if you plan to service this market. Check with your local public safety or fire authorities for the

pertinent regulations in your area.

Summary

Intrinsically safe radios cost more to purchase, use and maintain. They are not just a "good idea." There is a legal requirement to use these systems in hazardous areas.

Safety is the supreme cost factor. ■

Where to learn more

Underwriters Labs:

www.ul.com/hazloc/techsummary.htm

Canadian standards:

www.ul.com/hazloc/ref/canref.htm

Federal Mining Safety "Intrinsically safe" testing standards

199.115.12.200/regdata/msha/18.68.htm

National Electrical Code:

NFPA 70: National Electrical Code

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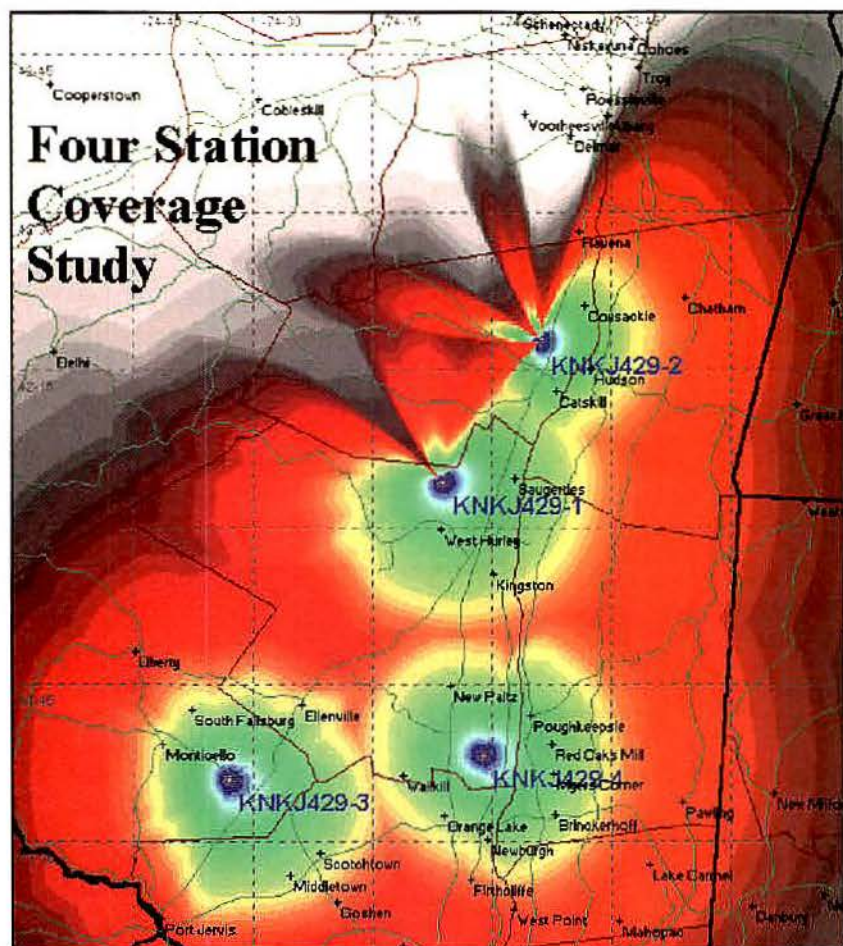
NFPA 70: National Electrical Code, 1993 Edition

Item No. PY-70-93SB \$46.75

To check current prices or to order these standards in the United States, call toll-free 800-344-3555.

Using an Internet search engine with the keywords "intrinsically safe," "Factory Mutual," "intrinsically safe testing," "29 CFR," "30 CFR" and related phrases should yield plenty of additional reading for the technician or salesperson who desires more expertise on the subject of intrinsically safe radios.

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Mobile workforce automation

The combination of vehicle tracking and real-time mobile data allows an itinerant workforce to function without constant return trips to a central office.

By Brett G. Lim

Automatic vehicle location (AVL) systems using the Global Positioning System (GPS) are rapidly becoming a necessity for government agencies and businesses with vehicle fleets. The declining price of GPS equipment, coupled with the development of a variety of wireless communications options, make AVL systems more accessible. To really take advantage of technological advances requires adding mobile data technology to AVL systems to create an efficient mobile workforce fleet.

The South Coast Air Quality Management District (AQMD) serves as the air quality regulation and enforcement agency for an area of 12,000 square miles covering four counties in Southern California. By monitoring and inspecting 31,000 commercial and industrial facilities in Los Angeles, Orange, Riverside and San Bernardino counties, AQMD inspectors enforce pollution emissions levels to maintain environmentally

worst smog problem in the United States. AQMD has a team of inspectors that is responsible for visiting sites around the district to ensure compliance with environmental standards and to respond to complaints.

With a jurisdiction of this magnitude, vehicle fleet monitoring and driver communication was a logistical and efficiency nightmare. AQMD came to Radio Satellite Integrators (RSI) for help. The solution was to implement a sophisticated and comprehensive vehicle tracking and wireless mobile data system.

"We have combined several technologies into the transportation portion of the AQMD solution: the Global Positioning System, wireless data technology and a geographic information system (GIS)," explained RSI President Jonathan Michels. "These integrated capabilities have the flexibility to accommodate complex projects like AQMD."

RSI equipped the AQMD vehicle fleet with an integrated system comprising a V-Track AVL system, the Mobile Navigator, and a suite of custom applications called the Mobile Inspector. Communicating through a wireless data network,

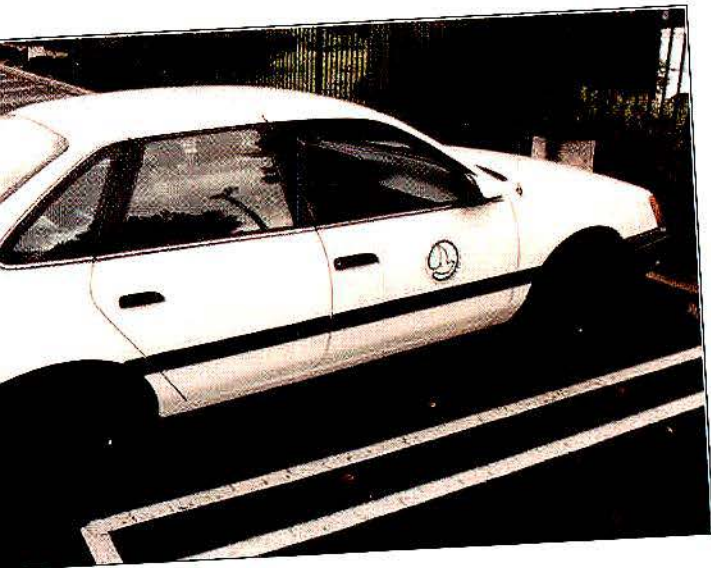
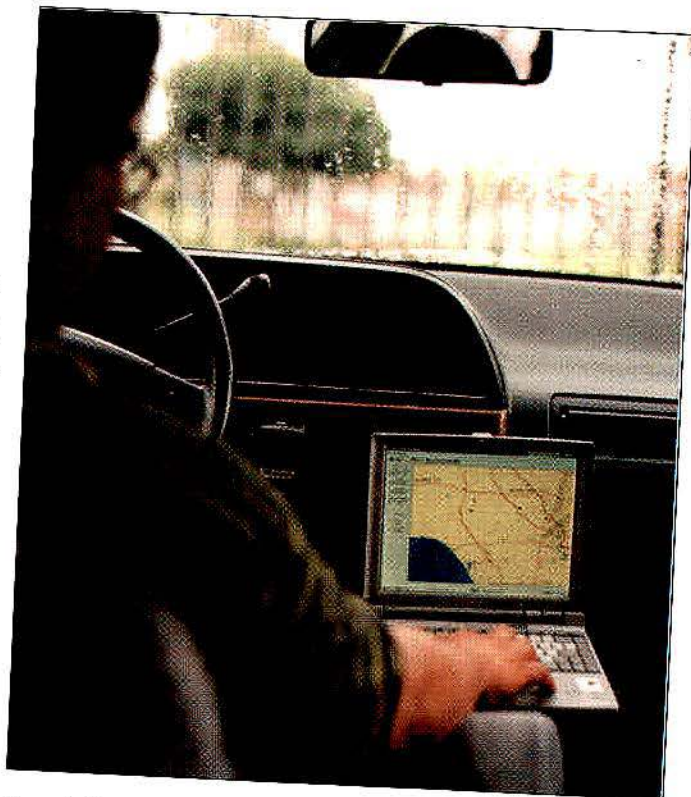
the transfer of information between each vehicle and the base station, allows the mobile inspector and central database to work as one cohesive unit. The tracking unit uses GPS

data to allow base dispatchers to know the precise location of the fleet in real time as well as to provide in-vehicle data for navigation. The tracking unit also relays other data between vehicles and the base station, such as messages, database queries and email. A "black box" on each vehicle contains a GPS receiver board, a micro-controller and an RF transceiver. In the AQMD system, a BellSouth Wireless Data transceiver is used to communicate all of the mobile data between vehicles and the base station. Dispatchers can ascertain the location of each vehicle on demand, or at a configurable polling rate. Vehicle location accuracy varies, depending on system configuration, but location can be as accurate as a few meters.

"We looked at our communications options, and a wireless data service provider like BellSouth Wireless Data was best suited for this application," Michels said. "[AQMD's] jurisdiction is too expansive for conventional two-way radio, and cellular would have been unnecessarily costly."

Wireless data services such as BellSouth Wireless Data offer coverage throughout

Lim is marketing and sales manager for Radio Satellite Integrators, Torrance, CA, www.radsat.com.



healthy air-quality standards. The combination of 14 million people, 9 million automobiles and a barrier of mountains leads to the

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most metropolitan areas in the United States. Using its data-only network, BellSouth Wireless Data can optimize its channels and data throughput over immense areas for a much smaller cost than regular cellular service.

The navigation software, running on an in-vehicle laptop, also uses the onboard GPS data and provides the inspector with desired in-vehicle navigation information, such as site locations, addresses, and current location, as shown in Figure 1 on page 54. The inspector works as the interface between the field unit and the central database and also enables applications like wireless Internet-enabled email, an automated daily activity log and real-time SQL queries on the District's Ingres database. RSI pioneered sophisticated wireless query agents for SQL database access.


Systems can be designed using a variety of communications modes, ranging from two-way radios to commercial satellite networks. The communications infrastructure varies, depending on what is available and cost-effective, given the needs of the client. If a customer has a fleet with an adequate existing radio system, that legacy system can be adapted to send all of the data. This way, the customer does not have to pay for wireless service charges or for the respective transceiver. In the AQMD project, the coverage

Figure 1. The inspection function provides navigation and central database information.

area of the inspectors is too large for a radio network, and the wireless data charges are negligible in a cost-benefit analysis anticipating increases in productivity, efficiency and inspector safety.

At the base station, vehicle locations are displayed on customized software running on a GIS-equipped mapping and display station PC. This computer is responsible for running the customized GIS, which displays data collected from the field units by the communications controller. This system uses a power-

ful GIS, ESRI's ArcView, as the basis for display and analysis, giving the user the capability to perform complex "spatial query" operations that take advantage of the geographic referencing of both the data collected and the base map (see Figure 2 on page 56). Vectorized maps allow the user to analyze space and time components in their entirety. Query capabilities are virtually unlimited and include route conformance analysis, schedule compliance (using actual time and position relative to planned schedule) and route



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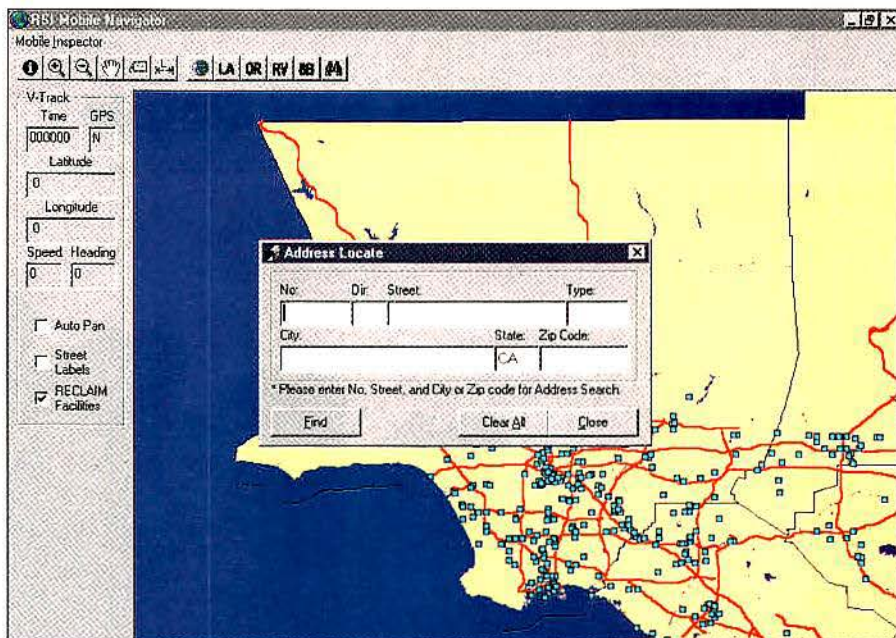


Figure 2. The navigation function uses GIS-based mapping to navigate and pinpoint locations.

optimization. This additional integration increases the value of the system to the user.

GIS mapping technology enables the user to view, follow, manipulate, log and analyze any variety of real-time spatial vehicle location information. The location data is transferred back to the base station in data packets

with unique inspector identification and GPS time tags. All data is compressed in real time using proprietary algorithms to maximize system performance and minimize data transfer costs.

Prior to switching to a wireless system, AQMD's inspectors were required to return

to headquarters (for some, a two-hour drive) just to receive work assignments and to access information. Now, inspectors can work entirely away from the office and can send and receive email, access corporate and customer information databases, receive work assignment dispatches and navigate to destinations, all from their in-vehicle laptops.

This technology is being used now by cutting edge agencies and companies, but soon any outfit with a vehicle fleet will need AVL and mobile data to stay competitive. Versatility will be a checkpoint for implementing an AVL system. Rather than a single "boxed" tracking solution for every application, a more efficient approach is to have a basic system that is customized to fit each customer's specific needs.

RSI has more than 60 systems in place worldwide, including applications for public safety, postal, courier services, military, utilities, armored vehicles, vessel tracking, and regional and long-haul trucking. ■



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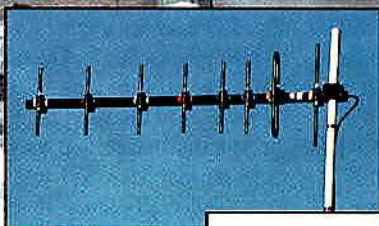
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SS7 and B.B. King

Don't get the interconnection blues. Get the right interconnection agreement with your local exchange carrier. Upgrade your paging terminal to establish SS7 capacity, if that's what you want. Otherwise, protect your right to maintain multifrequency (MF) signaling.

By Vic Jackson and Robert Schwaninger Jr.

As B.B. King would belt if he had gone into *paging* rather than *entertainment*: "Got the low-down interconnection blu-u-es..." wails the guitar known as Lucille. The riffs would bang off the strings like high-speed digitized data, tripping across a tandem switch; and the King, a.k.a. B.B., would search for a rhyming couplet that speaks to the soul of a trunk signaling protocol.

For those who have chosen paging over playing the blues, the question of whether to adopt SS7 interconnection has plunged them into the muddy waters of dealing with the local exchange carrier's (LEC) newest agenda to force touted upgrades on paging companies. The first test to determine whether a paging carrier is ready to deal with the LEC's request for the new interconnection method is to ask if the carrier can *spell* SS7. If it can get it right on the first try, we're rockin'.

But a number of carriers that are well qualified in the wireless world wouldn't know an SS7 if it were on the blue unitard of a superhero. They have a vague idea that SS7 is some telephone company digital trunk signaling protocol. But what that protocol means to them is wholly unknown. And although SS7 is used for many two-way wireless offerings, it has been slow to be adopted by the paging industry.

The situation that's causing paging companies to begin to migrate from older interconnection methodologies to SS7 is a change in the law. In 1996, Congress changed the way LECs and paging carriers would treat the termination of traffic from the LECs to the carriers' terminals. Congress' change in the important relationship of debtor/creditor, between the LEC and the paging carrier, simultaneously altered the status of terminals

and, in effect, turned them into central office switches. Since the advent of this watershed event, carriers are slowly looking at their connectivity and deciding whether it is time for a hardware change.

The multifrequency (MF) signaling used on most paging trunks is a 30-year-old technology. And as with all technology, intelligent operators have to decide whether an investment in new technology is appropriate. One could do as Blind Lemon Jefferson does, and just look the other way, but there are times when a smart operator considers his options.

Enter SS7, a.k.a. *Signaling System 7*, the cool, new form of connectivity that has stepped into the spotlight like Memphis Millie cranking it up to shake it down. Actually, SS7 has been around for quite some time by telecom standards. The telephone companies came up with it as a way of connecting all the dots in the wireline infrastructure, for the specific reason that they were trying to make more money. SS7 was designed to deliver higher efficiency in operation, while providing the trackability necessary to determine where, when and how the new services coming into the market were being used.

SS7 is essentially an intelligent, high-speed, packet data network. Common Channel Signaling/Signaling System 7 was first introduced in 1987 and is used to transmit call setup and network control information for calls on the public switched telephone network (PSTN). The configuration consists of two physically separate 64kbps data circuits, called *A-links*. The A-links connect to a mated pair of signaling transfer points (STPs). The redundant STPs perform message routing functions and provide information for the routing of messages between end offices.

The SS7 network exchanges a data message, the *initial address message* (IAM), between the originating end office and the terminating end office for each call prior to setting up a voice path. The IAM includes the called number, the originating number,

Jackson is president of Vic Jackson Interconnection Services of Okemos, MI; Schwaninger, MRT's regulatory consultant, is the principal in the law firm of Schwaninger & Associates, Washington. He is a member of the Radio Club of America.

forward-
ing and port-
ability information,
and other call parameters. This type of interconnection is generally referred to as *Type S*, as defined by Telcordia Technologies, TR-NPL-000145 technical reference. When used in conjunction with a *service control point* (SCP), it is the backbone for the Advanced Intelligent Network that provides most of the special and enhanced calling services available in the marketplace.

SS7 is the vehicle that allows such things as caller ID, "selective call forwarding," "portable" 800 numbers, "follow me" services and a host of lesser-known but sometimes useful services. It will easily support local number portability and other "exotic" new features of the telephone network. The cellular and PCS carriers use their customized version of this technology to allow roaming, prepaid and other innovative services among competing companies. When you hook into the SS7 network, you are connected in milliseconds to every other switch and database in the PSTN.

So, what you're buying is the capability to have the SS7 interface cards work within your terminal, assuming your terminal has the internal software to do the job. Some of the LECs have attempted to put themselves forward as the arbiter of what hardware is acceptable. However, these attempts appear to be overreaching, substituting their dictates for the authority of the FCC under Part 68 of the rules. Perhaps the greatest reason for using new equipment is that older equipment simply cannot handle the data speed for SS7 connection.

To establish SS7 capacity, you will have to upgrade your terminal, and that costs dough. Even the staunchest leadbelly might wince at the thought of paying for new terminal equipment. But if you are planning on looking at the possible advantages, now is the time. The world of interconnection, both the ways and the means, has come into the arena, backed by new laws and new ways of looking at things.

The new way of looking at paging is to see what ancillary services can be delivered using the same spectrum inventory and the same customer base, while offering additional services. Most paging systems offer voice mail, and many systems offer call forwarding of a kind, but to offer the entire panoply of services, one may need to consider upgrading the terminal and the signaling protocol, too. This upgrade opens the door to greater competitiveness and the keeping up with the Joneses (or Bessie Smiths) in the future of paging.

One thing to remember, however, is that SS7 connection is not mandatory. If you do not want to spend the money, or simply don't have it, then *take a pass*. Don't let the LECs tell you that it's mandatory. We can't find any legal support for such a demand. Therefore, negotiate an interconnection agreement that recognizes your right to maintain MF signaling until further notice. However, if you're ready for an upgrade, you might want to begin exploring terminal technology for this purpose. There might be a product that's cheaper than a programmable switch to get the benefits of SS7.

In the meantime, kick back and slap on your shades, while you swig a little whiskey or gin, and keep cool as you move forward in the world of interconnection, 'cause it ain't no thing.

*Woke up this morning...
My terminals is connectin'
Those pages are passin'
But has I been perfectin'*

*My woman said it ain't heaven
Without that new SS7
Is my position one where
I gots to lo-o-o-ose
'Cause I got them low-down,
interconnection blu-u-es!*

Sing it one more time.

SBT files request for interconnection ruling for MTA

Small Business In Telecommunications (SBT) has requested a declaratory ruling from the FCC's Common Carrier Bureau on the issue of the definition of "local calling area" as it applies to wireless carriers. SBT is seeking a ruling that would recognize that the local calling area for wireless services is the MTA and not those historical boundaries that are relevant only to wireline carriage.

The request was co-authored by SBT's general counsel, Robert H. Schwaninger Jr., and Vic Jackson, a consultant and expert on wireless interconnection. Although there's been more press given to the effect that the change in the law has had in leveling the playing field among carriers, much of the emphasis has been on the benefits to paging carriers. In fact, two-way carriers are better positioned as well.

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AdvanceTec Industries manufactures a negative pulse reconditioning charger for NiCD and NiMH batteries and a pulse analyzer conditioner. The two products combine to form a battery maintenance system.

www.advantecetec.com

Alphalogic Systems

Alphalogic Systems is the developer of Intracom management software for mobile electronic dealerships. It tracks a radio from the time it leaves your office, knowing every warranty repair, routine service and resell.

www.alsnet.com

AVCOM of Virginia

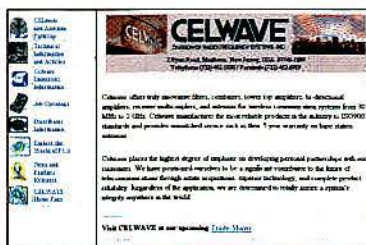
Avcom manufactures portable spectrum analyzers, network analyzers, microwave sweep generators, broadband noise generators, portable test receivers and microwave components including power dividers, dc power bocks/inserters, amplifiers, and log periodic antennas.

www.avcomofva.com

Berkeley Varitronics Systems

BVS designs and manufactures a complete line of wireless test instruments used for both deployment and evaluation of cell sites. All technical manuals and papers pertaining to these products can be accessed through the Berkeley Web site.

www.bvsystems.com



Celwave

Celwave, a division of Radio Frequency Systems, is a designer and manufacturer of wireless communications equipment and systems. The company's markets include OEMs, conventional two-way radio, cellular, paging and PCS. Celwave is headquartered in Marlboro, New Jersey.

www.celwave.com

CES Wireless Technologies

CES offers complete mobile data systems, AVL, hardware, software, signaling, microphones, interconnects and OEM services.

www.ceswireless.com



Connect Systems

Connect Systems manufactures tone panels, interconnects, LTR controllers and system decoders.

www.connectsystems.com

CPI Communications

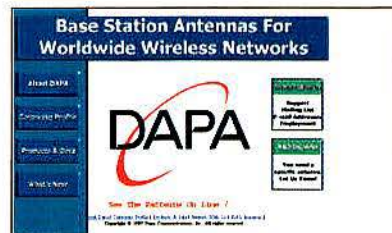
CPI Communications manufactures dc and tone remotes, local extensions, dc and tone termination panels and a variety of multichannel remotes.

www.cpicomm.com

Daniels Electronics

Daniels Electronics manufactures fixed and portable radio base stations and repeaters for two-way, trunking, mobile data, cross band and paging applications.

www.danelec.com



Dapa

Dapa is a worldwide leader in the manufacturer of base antennas for wireless networks. Recent developments include the Accubeam and the Harmony dual-band, dual-polarized antennas.

www.dapacom.com

Davicom Technologies

Davicom Technologies manufactures a full line of base station equipment including filters, antennas and remote monitoring systems.

www.davicom.com



Decibel Products

Decibel Products supplies the telecommunications industry with base station antennas, filters, combiners, remote monitors, cables, connectors and many new technologies.

www.decibelproducts.com

Doug Hall Electronics

Doug Hall Electronics manufactures a signal-to-noise voting comparator and remote receivers.

www.dheco.com



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EDX Engineering

EDX is a supplier of wireless communications systems design software for SMR/LMR, broadcast, paging, cellular/PCS, LMDS, MDS and WLL. EDX also offers a variety of U.S. and worldwide terrain, building/structure and geographic databases.

www.edx.com



Hutton Communications

Hutton online is an electronic product catalog on the Hutton Web site. The site gives customers access to more than 14,000 products from more than 120 manufacturers. Product illustrations and specifications are shown along with pricing.

www.hutton.com



ICOM AMERICA, INC.

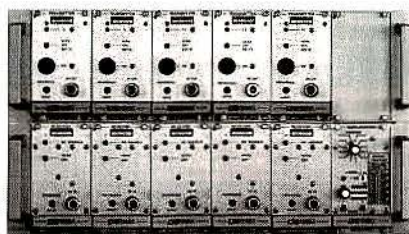
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ICOM America

ICOM's Web site contains information on ICOM radios for land mobile, amateur, marine and avionics as well as two-way commercial radios.

www.icomamerica.com



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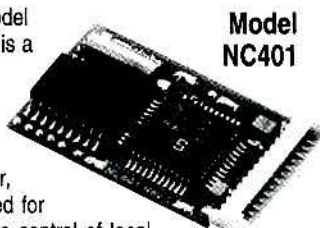
Visit us at IWCE, Booth #256

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For interconnect and remote control applications

The Model NC401 is a micro-miniature DTMF decoder, designed for selective control of local or remote applications. Measuring .80"W x 1.37"L x .23"H, the NC401 combines three distinct, multi-addressing decoders offering multiple user-configurable functions. All programmed features are stored in non-volatile E2PROM memory and are easily programmed by means of a conventional DTMF encoder or the Model NC500 Universal/P.C. programmer. This highly engineered decoder is ideal for portable radio applications having limited space for accessories. The NC401 comes complete with micro-miniature 14 pin header and 12" color coded cable assembly.

Nor-fax Doc. #5545



Model
NC401

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Nor-fax Doc. #5759

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This directory contains Web site addresses and descriptions of advertisers in this issue. The information is provided by the advertiser. For more information, refer to the ad index on page 104 for the reference to the companies' advertisements, or look them up on the Internet.



ICT

ICT manufactures more than 300 switching power conversions products for the mobile communications industry. The product line consists of ac-to-dc switching power supplies, base station covers, battery chargers, dc-to-dc converters, noise filters and surge protectors.

www.ict-power.com



Intek Global

Intek Global develops, manufactures, distributes and licenses wireless communications technology, products and services for the global wireless communications marketplace through Intek Global, Roamer One, Data Express and Midland brands.

www.intekglobal.com



ITECH

iTECH's IQten Battery Test System Version 2 Bar code scan sets up battery test programs in seconds. Select pass/fail capacity that works best for your application. Test reports may be used as battery performance "receipts."

www.itecheng.com



Kenwood

Kenwood Communications manufactures mobile and portable radios for conventional and trunked operations in government and private industry throughout the world. Kenwood Systems offers custom designed communications systems for government and business.

www.kenwood.net



Maxrad

Maxrad manufactures mobile, portable and base station antennas for voice and data in frequencies ranging from 27MHz to 5.8GHz. The Web site features specifications of our new low-profile and panel antennas.

www.maxrad.com




McManus Communications

McManus Communications is an authorized Motorola pager distributor, providing new, reconditioned and pager repairs. The Web site contains additional information.

www.mcmanuscomm.com

Welcome to the Microwave Power Devices Home Page



As an ISO 9001 quality system certified company, Microwave Power Devices, Inc. designs, manufactures and sells highly linear power amplifiers and related subsystems to the worldwide wireless telecommunications market. These single and multi-channel amplifiers, which are a key component in wireless base stations, increase the power of radio frequency and microwave signals with low distortion. In addition, the Company designs and manufactures high-power, solid-state amplifiers for satellite communications and medical applications. The Company also designs and manufactures amplifiers.

Microwave Power Devices


Microwave Power Devices designs, manufactures and sells linear power amplifiers and related subsystems to worldwide cellular and PCS infrastructure manufacturers and service providers. These amplifiers, both single and multi-channel, increase RF transmitted power with low distortion characteristics.

www.mpd.com

Mobile Radio Technology

MRT Online offers an overview of the current issue and a preview of next month's issue. The site also provides subscription information and a way to reach the editorial staff for comments and an article index to locate articles based on subject matter.

www.mrtmag.com



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Multiplier Industries

Multiplier Industries designs and manufactures batteries for portable power supply requirements. Working with OEM companies and aftermarket customers, Multiplier has produced more than 1,900 standard and custom battery types for two-way radios, cellular phones and pagers.

www.multiplier.com

Newmar

Newmar manufactures communication power products, power supplies, battery chargers, power converters and accessories. The Web site features a full on-line catalog, including a new PM/PFM system debuting at IWCE.

www.newmarpower.com

Norcomm

Norcomm produces data/tone signaling products for two-way radio and wireless communications systems in a full range of formats including DTMF, DCS, CTCSS, two-tone, digital, voice scrambling and encryption.

www.norcommcorp.com



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OUR COMMUNICATIONS CONTROL SYSTEMS

Orbacom Systems

Orbacom Systems provides consoles, including the self-contained Calida+ TDM-150 Series, the Genesis computer-aided dispatch and records management, an integrated dispatch system with E9-1-1 CAD mapping and radio dispatch at a single position.

www.orbacom.com

Paging and Wireless Service Center

Paging and Wireless Service Center offers Motorola fire pagers with monitor and tone alert capabilities, available new or reconditioned. The site includes an online directory of radio batteries, accessories and chargers.

www.pwservice.com

Penta

Penta manufactures a cost-effective console system, employing a non-blocking switch matrix design that integrates the control of radios, telephone, intercom & PBX circuits into a single affordable system.

www.penta-corp.com

PiRod

PiRod engineers and manufactures a full line of solid-rod towers, monopoles, antenna mounting and tower maintenance products. Tower specification guide and product information is available online or by mail.

www.pirod.com

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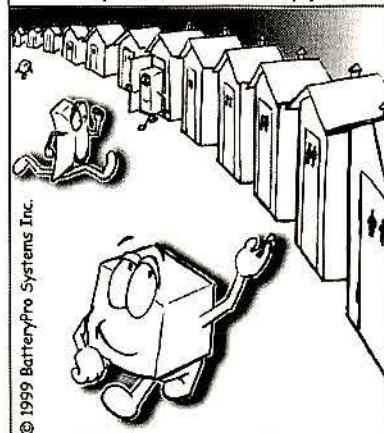
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Pryme Communications

Pryme Communications manufactures light-duty headsets, surveillance mics and other accessories including NiCD and NiMH battery packs for many portable radios.

www.pryme.com



RadioSoft

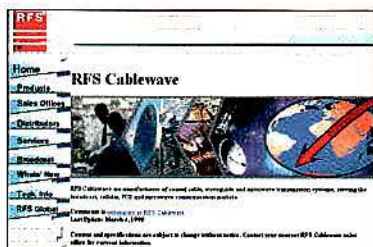
RadioSoft manufactures engineering software for the entire spectrum of radio communications. The strength of the software is accuracy, affordability and ease of use.

www.radiosoft.com

Raine

Raine is a manufacturer of heavy-duty nylon cases for two-way radios, cellular phones and pagers. Raine also produces nylon gear for military, police, industry and public safety.

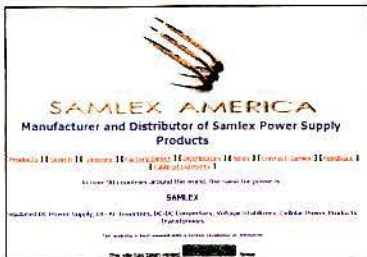
www.rainelinc.com



RFS Cablewave Systems

RFS Cablewave Systems designs and manufactures RF and microwave transmission line products: Flexwell foam cables, air cables, radiating cables, connectors, installation accessories, jumper cables, microwave antennas and elliptical waveguides.

www.cablewave.com



Samlex America

Samlex America manufactures power supplies designed for the telecommunications industry. The Web site features product photographs specifications, applications, design features and distributors.

www.samlexamerica.com

Southwest Windpower

The Air Industrial is the latest model of Southwest Windpower's battery charging wind turbines. The turbine is designed to produce power for remote telecommunication and repeater sites.

www.windenergy.com

Thunder Eagle

Thunder Eagle is a designer, manufacturer and distributor of weather alert radios for emergency management and other professional users. The Weather Eagle radios find the strongest NOAA weather radio channel.

www.thuneagle.com



TPL Communications

TPL Communication manufactures products for the mobile radio industry, primarily high-power RF amplifiers for mobile and base station use, including repeaters and paging, as well as mobile chargers for portables.

www.tplcom.com



Vega

Vega is a manufacturer of specialized radio/telephone dispatches control consoles and associated base station adapter panels. Other products include audio processors, audio amplifiers and tone encoder/decoder modules for system applications.

www.vega-signaling.com



W & W Associates

W & W Associates is a leading U.S. manufacturer of two-way radio replacement batteries, chargers and analyzer/conditioners. More than 200 charger and analyzer adapter cups are available for land mobile radios, cellular phones, camcorders and laptops.

www.wwassociates.com



Zetron

Zetron designs, manufactures and markets more wireless communication systems including radio and telephone consoles, paging systems, trunked radio, SCADA and telemetry, utility networks and land mobile radio.

www.zetron.com

Regional APCO attracts record number of exhibitors

About 1,330 attendees gathered March 15-17 at the San Diego Concourse to participate in the 29th Annual APCO Western States Regional Conference (WSRC). The conference featured 120 exhibitors, the largest number ever for a regional APCO conference.

The 1994 Western States Conference in Anaheim held the previous record at 98 exhibitors. "One of the committee's goals was to break that record this year," said Lyn Diebold, WSRC committee program chair.

Attendees participated in several sessions centering on the theme, "Telecommunications—the Wave of the Future," ranging from Y2K to the future of W9-1-1. Favorites included the FCC regulatory, enforcement and border interference panel and Andy Seybold's presentation, "21st Century Communications, the Facts vs. the Hype."

Another highlight was humorist and satirist Stan Freberg's presentation, "When Your Voice is All You Have," highlighting some of his own experience and



CPRA President Bryan Hawkins and Conference Chair Ralph Blount.

a few of his most well-remembered radio commercials from the 1950s. The presentation followed the opening breakfast at the Westin Hotel Ballroom and provided a lively and humorous warm-up for the sessions to follow.

John Clark, who now is a senior attorney in

the Public Safety and Private Wireless Division of the FCC's Wireless Telecommunications Bureau, spoke at the conference in his previous capacity as deputy chief of the division.

Clark gave the keynote speech at the opening breakfast, and he participated in the FCC Panel as well as in the session, "Y2K, What's Really Likely to Go Wrong." CPRA has often referred to Clark as "one of the best friends that public safety has ever had" because of all that he has done for the industry during his time in office.

The conference also included several special events. One of the favorites was the Family Fun Night at Sea World. APCO and sponsor GTE provided dinner and gave attendees and their families a chance to have exclusive use of the park during the event.

TriTech Software Systems provided a wine and cheese reception and Plant Equipment put on a St. Patrick's Day boxed lunch. Sponsors of other events included Pacific Bell, Alcatel, Harris Communications, Xypoint, Nextel Communications, Lucent Technologies and Motorola.

Diebold said that the program committee had received mostly a positive response from the comment forms they had collected from registrants.

"We have the advantage of a very active chapter, and the West coast has a huge population," Diebold said, "I think it went great."

APCO sponsors Y2K session at Motorola

The Association of Public-Safety Communications Officials — International (APCO) is planning a Y2K Symposium May 20-21 in Schaumburg, IL, at the Motorola educational facility. The FCC, the President's Council on Y2K, utility compa-

nies, public safety communications center directors, and manufacturers have been invited to present and moderate sessions.

For further information, contact APCO at 888-272-6911, ext. 250, or visit the APCO Web site at www.apcointl.org.

Transcript names CEO, wins Johnson contracts, ships Intek Global order

Transcript International, Lincoln, NE, has selected a new chief executive officer. It also has won contracts to build two public safety radio communications systems. The company's 1998 financial results included multimillion-dollar, one-time charges and an overall loss.

Transcript named Michael E. Jalbert, 54, as president and chief executive on March 1 with a \$295,000-per-year salary and a \$150,000 signing bonus. On March 25, the board elected him chairman, too. He previously headed Microdyne, Alexandria, VA, which was acquired by L-3 Communications. Microdyne manufactures signaling and telemetry products and provides technology out-sourcing services.



Jalbert

Former Chairman John Connor had served as interim chief executive since Jeffrey Fuller resigned last year. Connor, who is one of the largest individual investors in Transcript, re-

mains a director and has agreed to a one-year consulting arrangement to assist Jalbert with the transition. He will also assist with matters facing the company including pending class action lawsuits and strategic initiatives.

The city of Waterbury, CT, has awarded the company's EFJohnson Division a \$4.7 million contract for a two-site, 800MHz, Multi-Net II, simulcast, trunked radio communications system. It will handle 500 portable and 150 mobile radios and will provide integrated communication for Waterbury's police, fire and other public safety agencies. Staging is to begin in May with system completion in 2000. EFJohnson will assist Waterbury in training, project management and system maintenance.

Anderson, IN, has awarded EFJohnson a \$1.3 million contract for a smaller, yet similar, system and for services. The backbone of the system will be an 800MHz Multi-Net II trunked radio switch. The system will handle communications for 17 city departments. It is scheduled for completion in late 1999, depending on the city's completion of a new 9-1-1 facility.

EFJohnson has begun shipping product to New York-based Intek Global under an agreement to manufacture Intek's 220MHz linear modulation (LM) land mobile radios. Transcript expects to ship the order, valued at about \$1.8 million, between now and September.

Transcript ended 1998 with a loss of \$22.3 million, compared to a loss of \$10.9 million in 1997. The 1998 loss includes \$10 million set aside for possible settlement of class action lawsuits arising from huge fluctuations in the company's stock price. It also includes charges of \$1.2 million connected with layoffs and other workforce changes, and \$3 million for legal, audit and severance expenses associated with the company's restatement of its financial statements, an audit committee investigation, class action lawsuits and a Securities and Exchange Commission investigation. The 1997 loss included a charge of \$9.8 million for in-process research and development cost in connection with its acquisition of the E. F. Johnson Company.

AMTA adjusts dues, focuses on 'bottom line'

The American Mobile Telecommunications Association (AMTA), Washington, is redefining its mission to focus on the "bottom line" with its membership services. It is moving its magazine, *Open Channels*, to the World Wide Web. And it is reorganizing its membership to "strike a more optimum balance between large-, medium- and small-company members," an AMTA statement said.

The association's president, Alan Shark, explained that "balance" had meant a dues adjustment for the 14 members in the large-company category, including a reduction for some, so that all 14 now pay the same rate. It has meant a dues increase for some medium-size companies. Small-size companies' dues are up slightly, but mostly unchanged. The result is a flatter dues structure, yet still proportional by size of company member.

"What we're addressing is the consolidation of the marketplace," Shark said. "There now are fewer, but stronger, companies."

AMTA has a smaller trade show than those of the Cellular Telecommunications Industry Association (CTIA) and the Personal Communications Industry Association (PCIA), with an attendance of hundreds, not thousands. Although it has an advantage of focus, it lacks economy of scale.

AMTA does not receive income that compares with CTIA and PCIA. Nor does it receive income from frequency coordination

services, as do PCIA and the Industrial Telecommunications Association. AMTA, Shark explained, relies heavily on membership dues for operating funds.

In addition to its annual trade show, AMTA sponsors several annual conferences. Through these conferences, the trade group will help members to position their busi-

nesses for the future and to respond to the changing needs of their customers, reflecting a focus on their members' "bottom line."

"We are different from any other trade association," Shark added. "Most of our members emphasize business, not consumer, communications, even those with Commercial Mobile Radio Service (CMRS) licenses."

"When we include players that are not CMRS, we are 'non-consumer wireless.' AMTA remains focused on small- and medium-size wireless business-to-business communications operators and manufacturers. Eight major manufacturers are on our board, sitting right beside our operator board members, making for a healthy exchange and dialogue for setting future direction and policy."

In addition to adjusting its dues, AMTA has trimmed its staff as part of reducing costs. The trade group's vice president of communications and association services, Louise P. Tucker, has exited, as has an administrative employee.



Shark

FCC Notes

Commission adopts NPRM to review auction authority

The commission adopted a Notice of Proposed Rulemaking to evaluate the impact of the revised law on the commission's auction authority for wireless telecommunications services. The notice seeks comment on the scope of the Balanced Budget Act's exemption from competitive bidding for licenses and permits issued for public safety radio services.

The notice also seeks comment on a Petition for Rulemaking that proposes the establishment of a new radio service pool for use by electric, gas and water utilities, petroleum and natural gas pipeline companies. The notice seeks comment on implementation of Section 337c, which allows providers of public safety services that meet statutory criteria to apply for unassigned frequencies not otherwise allocated for public safety purposes without engaging in competitive bidding.

CIB fields 1,200 interference complaints in the past year

During the past year, the Compliance and Information Bureau responded to over 1,200 interference complaints from public safety and emergency officials seeking assistance, many involving life-threatening emergency situations.

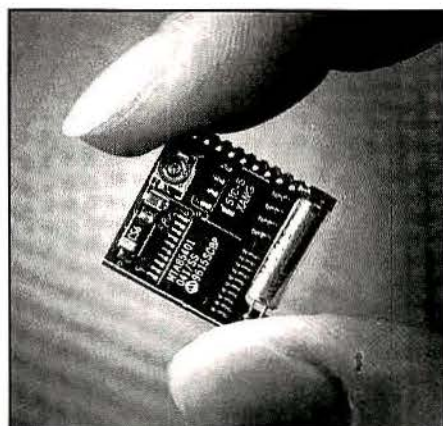
The bureau alerts and dispatches local FCC field office agents to locate and resolve the interference problems, giving priority to emergency situations involving potential harm to life and property. Of 1,200 requests, 674 were from state and local public safety emergency services.

Sacramento County requests waiver to obtain license for paging frequency

The County of Sacramento, CA, files a Request for Waiver of a licensing freeze that currently governs frequencies in the 929MHz-930MHz band allocated for exclusive paging operations. Sacramento County requests the waiver to permit it to use the frequency 929.0125MHz for a local alert paging system that would support public safety services provided in Sacramento and Yolo Counties, both in California.

The frequency is currently unassigned in the Sacramento area, according to the county, except for co-channel licensee Stanford University Hospital. The county said that the hospital concurred with the county's request to use the channel together, on a shared basis.

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Manufactured by Control Signal®, the ID-12 ANI encoder is a cost-effective way to upgrade all the radios in your fleet with ANI that is compatible with Motorola MDC-1200. Works in all radios, and its tiny size (.59" x .65" x .12") allows it to fit in virtually all hand-holds. Has leading and trailing IDs, emergency, and time-out timer. Fleet price (100 qty) \$89 ea. Dealers: Call for pricing.

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Shrinking Glenayre Technology divests businesses, including CNET

Glenayre Technologies, Charlotte, NC, rode high during the wireless boom from mid-1995 to mid-1996. As its business declined, however, its stock price tumbled from a high near \$50 in 1996 to \$3.50 in March 1999. The company designs, manufactures, markets and services telecommunications equipment and software for wireless personal communications systems. Sales in 1998 decreased 11% to \$399.9 million as compared to \$451.7 million in 1997.

In 1997, Glenayre acquired Santa Clara, CA-based Wireless Access, a developer and marketer of two-way paging devices; Norwood, MA-based Open Development, a developer of database management systems providing applications for calling cards; and Plano, TX-based CNET, a developer of software including network management tools.

► Wireless Access, acquired for \$100.4 million, is a keeper, although it had problems starting up its products in the second quarter of 1998. Money had to be pumped in to rework the paging devices in the fourth quarter of 1998. With those problems behind it, Glenayre expects increased pager device production yields in the first half of 1999.

► Open Development's value proved to be much less than its \$48 million purchase price, resulting in a write-off of about \$27 million, although Glenayre has retained the business unit. Open Development originally targeted prepaid wireless, prepaid wireline and postpaid calling to deliver its platform products for database management by telephony network operators, and that strategy was reflected in the purchase price. Glenayre's attempts to sell to the prepaid wireline and postpaid calling markets were not productive. In the fourth quarter 1998, after incurring significant operating losses from the business, Glenayre decided to focus on the prepaid wireless market and to accept the reduced revenue potential. The Open Development operating facility was closed in March, and research and development and administrative functions were relocated to Atlanta. Open Development's products will be moved to Vancouver.

► CNET was purchased for \$7.7 million. It had \$5.2 million in assets left when it was sold under a deferred payment plan in December 1998. The entire \$5.2 million was written off as a loss. If the purchaser makes money with CNET, Glenayre will receive payment as much as \$1 million. In the fourth quarter of 1997, Glenayre concluded that the market for CNET's products had shrunk. Fewer uses for CNET network management tools existed than Glenayre had thought and development costs for RF propagation software were greater.

► Glenayre has wanted to sell its microwave division, Western Multiplex, since September 1997. It acquired the company in April 1995. A sale would help Glenayre to focus on

its core markets of paging and enhanced messaging.

In 1997, Glenayre began expansion of its Vancouver facility for research, development and service. The cost was expected to be \$19 million. During the first quarter of 1999, construction was halted, and revised plans were made to complete only a parking facility and a 16,000-square-foot first level for \$11.7 million.

Shrinking a business can be costly. Glenayre recorded a loss of \$8 million to cut 10% of its workforce in 1998, to exit facilities

and to offset the reduced value of other assets. On Feb. 1, 1999, it cut another 100 employees at a cost of \$1 million. About 2,000 employees remain. Stan Ciepielinski, chief operating officer of Glenayre, said, "This restructuring allows us to be more flexible and adapt quickly to the changing business landscape. We are committed to increasing shareholder value by focusing on the development of new markets and devoting rigorous attention to bottom line growth. We believe these actions help ensure the long-term viability of the company for our customers and especially for our employees."

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Toronto man settles with Motorola

Ronen Katz, a Toronto resident, has settled a lawsuit brought against him by Schaumburg, IL-based Motorola for copyright and trademark infringement.

As part of the settlement, the Federal Court of Canada in Toronto entered a permanent injunction barring Katz from any unauthorized reproduction, use, sale or distribution of Motorola's proprietary, copyrighted or trademarked materials, including copyrighted computer programs. The court also prohibited the defendant from aiding or abetting any other person or entity from engaging in any prohibited acts.

Neither Motorola nor Katz's attorney, Samuel S. Marr, would disclose the settlement's financial terms. Motorola claimed that Katz infringed on its copyrights and trademarks by possessing and using unauthorized copies of Motorola's Radio Service software, which is used to reprogram the operating characteristics of Motorola's microprocessor-controlled two-way radios.

Mobex supports evidentiary hearing on Nextel antitrust consent decree

McLean, VA-based Nextel Communications' request to vacate a 1995 antitrust Consent Decree that limits Nextel's licenses in 14 markets is currently under investigation because of a Memorandum Opinion and Order of the court issued by Judge Thomas Hogan, U.S. District Court judge for the District of Columbia. Mobex opposes lifting limits on Nextel's ability to compete in the 14 markets. Mobex Communications said that it would stand by the judge's ruling and provide input to expedite the evidentiary hearing.

"Mobex Communications will do everything possible to fight for the preservation of competition within the SMR industry," said Frank Casazza, Mobex's president.

Claims against Katz included the illegal possession and use of software system keys to program radios to operate on specific radio systems. Motorola also alleged that software was used illegally to duplicate the identifications of Motorola's legitimate customers to obtain access to and use of trunked radio frequencies that are restricted to law enforcement, fire and related public service uses. It also claimed that, in his dealings with others, Katz used Motorola's registered trademarks to create the false impression that the radios originated with or were approved and authorized by Motorola.

"The defendant in the suit programmed radios to operate on public safety and other shared radio systems and provided them to users who were not authorized to have access to these networks," said Anthony J. Biell, software protection manager. "This action is part of a continuing effort to protect Motorola's intellectual property rights against their unauthorized, illegal and illegitimate use. The unauthorized use of software and system keys can result in serious problems for our customers."

"We fully respect Judge Hogan's decision to look further into the matter of monopolistic practices by Nextel and encourage other SMR providers to do the same. But in the end, we believe the investigation will confirm the importance of competition."

The investigation will explore the 900MHz spectrum licenses held by SMR providers to determine whether the existing Consent Decree should be vacated. Mobex believes lifting the decree will allow one company to dominate the spectrum, eliminating competition.


On February 17, Mobex filed a motion asking for the enforcement of the decree after a Delaware bankruptcy court approved Nextel's bid to purchase licenses held by Geotek Communications that were covered under the Consent Decree agreement. On March 5, Nextel Communications requested the judge to vacate the Consent Decree that would allow it to hold more 900MHz licenses in 14 major U.S. markets.

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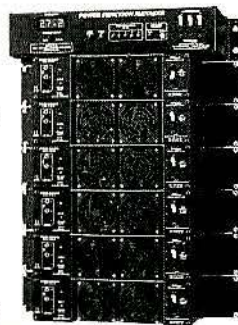
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Intek targets Texas; inks TETRA pact, delays portable introduction

Intek Global, New York, is taking steps to serve more 220MHz subscribers in Texas and to extend its technology agreements involving linear modulation (LM).

In a move to make Texas one of its largest regional markets, Intek will broaden its dealer relationship with Dallas-based 2001 And Beyond, a unit of Blythe & Nelson Co. Because the Texas dealer has posted "robust sales" of LM products and services to mobile radio users in Dallas and El Paso, Intek will deploy substantial added 220MHz spectrum there. Also, it will activate new spectrum for a sales drive that the Texas dealer will launch in metropolitan Houston, San Antonio and Austin.

2001 And Beyond already has added 900 users. New customers for high-speed data and voice applications included transportation and field service firms, a large home maintenance operation and numerous dispatch companies. Intek is already delivering equipment and infrastructure to 1,465 additional customers as part of a total of 2,400 new Texas subscribers

on the Roamer One airtime network. Sam Cagle, a partner with 2001 And Beyond, said:

"Our association with Intek Global has been a winner from the start thanks to the remarkable capabilities of the state-of-the-art mobile radio systems we are selling to Texas mobile fleet operations. They have responded beyond our most optimistic expectations."

Bob Kelley, another 2001 And Beyond partner, added: "This agreement with Intek Global gives 2001 And Beyond the opportunity to expand our Texas presence to include additional markets in

Texas as well as the Southwest. Intek Global's products and services are a perfect fit for our target markets."

More than 60% of 2001 And Beyond's sales to Texas fleet operators have included Data Express automatic vehicle location (AVL) tracking service.

Technology agreement

Intek's research and design subsidiary,



Hillum

Intek Global Technologies (IGT), Bath, UK, has signed a licensing agreement to design a UHF LM digital transmitter for Teltronic s.a., a Spanish land mobile radio manufacturer. The Cartesian-loop transmitter design will be used for Teltronic's Trans-European Trunked Radio (TETRA) products.

Rick Hillum, IGT president, said: "Teltronic is one of Europe's more forward-looking, innovative companies in the mobile radio sector, and we welcome this opportunity to introduce LM technology to another TETRA system manufacturer."

Vicente Aguado, Teltronic's technical director, added: "IGT has made a genuine advance with LM technology, enhancing spectrum efficiency as well as the clarity, reliability and speed of data and voice transmission. We are eager to adopt it for our radio wireless products."

Intek and TETRA

Regarding Nokia's use of LM in its Trans-European Trunked Radio (TETRA) products under a five-year technology, development and supply agreement announced in April 1998, Nokia has yet to begin using LM.

"We are not using linear modulation in our TETRA products," said Pekka Blomberg,



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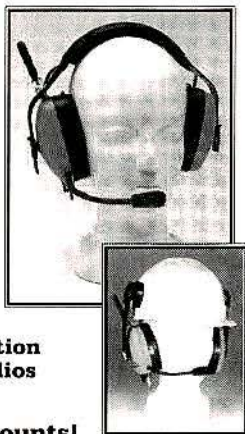
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system marketing manager, TETRA Professional Mobile Radio at Nokia. "We do have a cooperation for the use of linear modulation, but that is only for our MPT analog trunking products."

Hannu Vilppunen, manager of Actionet Product Marketing for Nokia, added: "Nokia is not using linear modulation narrowband technology in its current analog MPT1327 products. There have been some discussions with [Intek subsidiary] Linear Modulation Technology Ltd. about the feasibility of this technology, but no product decisions have been made, and we have no current activities around this issue."

Although LM is not yet incorporated in the Nokia production line, a source close to Nokia said that IGT (the new name for Linear Modulation Technologies Ltd.) is developing an LM application-specific integrated circuit (ASIC) for Nokia. When ready, the chip would make it possible for Nokia to use LM with its TETRA products.

As an example of the large market that TETRA represents, Dolphin Telecom and Nokia signed a contract for the delivery of a TETRA network in France. The value of the contract is more than 150 million Euros (\$168 million).

Nokia will deliver and implement a complete network including switches, base stations, dispatching equipment and a network management system. Mikko Heikkonen, president, Network Systems, Nokia Telecommunications, said: "We are looking for a successful partnership with Dolphin Telecom in building the first nationwide digital commercial professional mobile radio network in France, supporting advanced voice and data applications."

Portable transceiver

Although last year Intek stated that its portable 220MHz transceiver would be introduced by the end of first quarter, about 18 months behind the original schedule, that time came and went without units being made available for purchase.

"It's close," a company spokesman said. "But I won't commit to an introduction date until production units have been tested." The first production line units were due in the United States from the UK manufacturing facility during the last week of March.

Shiver contract

Intek's board of directors has extended Robert J. Shiver's contract as chairman and chief executive officer to Sept. 8, 2001. He took that post on Sept. 8, 1997, having previously served as a board member.

Penske invests in Terion, originally FlashComm

Penske Capital Partners and a group of other transportation industry companies recently made a substantial cast investment in Terion, becoming equity partners. Terion was originally incorporated in 1994 as "FlashComm," with a mission to become a provider of mobile information systems using proprietary two-way wireless communications. The assets of the company include patents and other intellectual property originally developed by Harris for the U.S. government. Terion has adapted the technology to commercial application and is focusing toward meeting the needs of transportation customers.

In addition to Penske Capital Partners, other new investors include Delphi Automotive Systems, Detroit, KteCom, LLC, a company controlled by Knight Transportation and Madison Venture of Vancouver, Canada. Madison Venture will participate in development of the Canadian market. These companies join Harris Venture First Associates of Melbourne as strategic equity partners.

In addition to gaining financial and management strength from the new investors, Terion will use the networks of companies affiliated with Penske Capital Partners, including Penske Truck Leasing.

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Connecticut awards contract to Motorola

The state of Connecticut has awarded a \$36 million contract to Motorola for an 800MHz digital trunked simulcast radio system. The state's existing system was designed in the 1940s.

The new system's simulcast configuration is designed for the State Police to communicate reliably throughout the entire coverage area whether they are on foot or in a vehicle. Under the contract, Motorola will be providing a system that meets a standard of 98% voice coverage of the total land mass of the state in all seasonal conditions measured on a troop by troop and statewide basis.

Rock Regan, chief information officer for the Department of Information Technology said, "The Department has helped negotiate a contract putting the best proven technology available into the hands of our law enforcement officers. This technology meets an urgent need and supplies critical support to our state troopers. It will enable the swiftest possible response for their safety and that of the public."

Henry Lee, Commissioner of the Department of Public Safety said, "With the addition of this new 800MHz radio system, including the mobile data terminals, our troopers will be equipped with a vital 21st century crime fighting tool."

Antenna assists in fighting 1998 forest fires

Forest firefighters combating the extensive firestorms that swept through Florida last summer found a new ally in a relatively small piece of equipment: a cast-aluminum two-way antenna. The antenna enabled firefighters to communicate with one another during the tense and grueling natural disaster that devastated thousands of acres of forestland in Florida and Georgia in July and August last year.

STI-CO Industries, Orchard Park, NY, was the unit manufacturer for this special antenna. STI-CO specializes in a variety of mobile and non-mobile antennas that service the law enforcement, emergency vehicles, transit and fleet vehicles, as well as private industries.

Mike Stokes is president of Tim-Prep, a north Florida underground utility and earthwork contracting company in Baldwin that assists the Florida and Georgia Forestry Departments, in addition to providing heavy duty construction for utility and paper companies.

"We used the antenna on our bulldozer, and it did not fail us. It is vitally important

for us to communicate with the Forestry people in the field during a firefight. Any product that can withstand the tremendous beating in that environment is a product we'll continue to utilize in our operations," Stokes said.

The STI-CO antenna, called the LP-1-150, has VHF frequency range of 150MHz-174MHz with a 3MHz bandwidth. It can

The antenna



The two-way antenna allows firefighters to communicate during emergencies.

handle 300W of power, and it is 4.2" high. Other similar models have frequency ranges from 136MHz-1,000MHz and are also available with a strong ABS plastic radome. There are also low-band, UHF, cellular and GPS models in cast aluminum or radome versions.

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Frankel replaces Brown as Datamarine chairman

Datamarine International, Mountlake Terrace, WA, has a new chairman, Stephen Frankel, who has been a director since 1997. Following the company's annual meeting on March 9, Frankel succeeded Peter Brown, who has been the chairman or a board member for more than a decade. Brown continues on the board of the marine and land mobile radio communications equipment manufacturer.



Thompson

Frankel said that with the company's marine communications products running at a record high backlog, and future purchase commitments for 220MHz systems continuing to develop, he is pleased to have the opportunity to help Datamarine to maximize its opportunities. The company's fourth quarter report put the backlog at \$865,000 worth of marine communications products as of January 2, with \$228,000 booked for land mobile radio equipment and \$128,000 for marine instrumentation.

In a statement issued March 24, Datamarine's president, David Thompson, said that the backlog for 220MHz land mo-

bile systems had exceeded \$1 million and was growing. He set the marine equipment backlog at \$1.7 million.

"This order placement is consistent with our expectations, as license winners in the 220 auction start to execute their plans to build out their systems," Thompson said. "Waiting for the 220 service to start again has been difficult but there now clearly is movement." The statement said Thompson anticipated the issuance of the auction licenses by the FCC during the last week of March.

SEA, a Datamarine subsidiary, manufactures 220MHz mobile radios for voice and data transmission, portable radios and base station repeaters. It designs and develops 220MHz radio systems.

Frankel takes on a challenge because the company's fourth quarter report states that, as of January 2, its principal sources of liquidity consisted of \$225,000 in cash and equivalents. Its bank was not making any additional advances. Datamarine faces continuing operating losses and negative cash flow. The company has engaged an investment banker to raise about \$3.5 million in subordinated debt to redeem existing debt and to provide working capital.

SCA, Ameritech create mobile data system

Software Corporation of America (SCA) has formed an alliance with Ameritech, the Illinois State Police (ISP) and the Illinois department of central management services (CMS). SCA is planning to install the largest number of wirelessly enabled computers in public safety history across Illinois empowering state and local police to access a driver's criminal record using only the license plate number.

The Illinois Criminal Justice Information Authority's (ICJIA) area-wide law enforcement radio terminal system (ALERTS) mobile data network provides services for more than 3,000 users in middleware (TX emulation). ICJIA intends to replace its middleware with SCA's Premier MDC software, creating a consistent middleware platform in Illinois on both ALERTS and Illinois Wireless Information Network (IWIN) CDPD networks.

SCA will provide Premier MDC, the mobile data communications software for IWIN, as the Illinois State Police (ISP) will initially equip 1,000 police officers with its wireless data system. Another 200 laptops that are already installed will also be configured to run on the system. IWIN could potentially support more than 5,000 mobile data computers by 2002.

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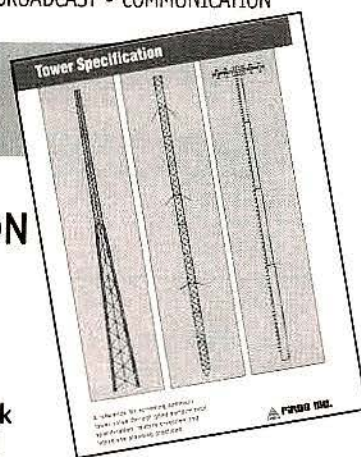
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News Notes

Tessco Technologies, Hunt Valley, MD, has launched the Tessco Magic Online Web Site with an Internet version of its printed buyers' guide. (www.tessco.com) ... The **Personal Communications Industry Association** wants the FCC to reserve the 2.11GHz-2.15GHz band for third-generation (3G) wireless. (www.pcia.com/advmnfr.htm) ... Harrisburg, PA-based **AMP** has lifted registration requirements for its on-line catalog of 95,000 connector products. (www.connect.amp.com)

The **Industrial Telecommunications Association** supports an FCC waiver request by **Commonwealth of Pennsylvania** and **GPU Energy** to give any public safety and power radio service eligibles access to public safety and industrial business channels that the requesters propose to share—but only if the commission lifts the inter-category freeze so all classes of industrial and land transportation radio service eligibles can use public safety frequencies when participating in non-profit, cost-sharing joint ventures with public safety agencies. (www.ita-relay.com)

On April 27, during the afternoon prior to the International Wireless Communications Expo in Las Vegas, **Simulcast Solutions** of Fairport, NY, is conducting a forum on wide-area communications. (www.simulcastsolutions.com) ... In addition to its new power supplies, Coquitlam, British Columbia-based **Samlex America** offers factory direct reconditioned supplies. (www.samlex-america.com) ...

The **Houston Police Department**, which provides law enforcement services to the nation's 10th largest city, is now making use of a new TDM Series console installation for radio and telephone communications in its main dispatch center, in addition to command and training operations. The console is made by Cinnaminson, NJ-based **Orbacom Systems**. (www.orbacom.com)

Kenonic Investments, Calgary, Alberta, has purchased Calgary-based **BatteryPRO Systems**. (www.battery-pro.com) ... Carrollton, TX-based **Hutton Communications** distributes Uniden two-way radios, accessories and parts nationwide as an authorized **Uniden Communications** distributor under an agreement announced Feb. 1. (www.huttoncom.com) ...

Hutton Communications' Atlanta sales and warehouse branch has relocated to a new 50,400-square-foot shared facility (with Andrew) in an Atlanta suburb. The new address is 775 Tipton Industrial Drive, Suite F, Lawrenceville, GA 30045; phone numbers are unchanged. (www.huttoncom.com) ... **CommScope**, Hickory, NC, has purchased **Texas Instrument's** clad-wire fabrication equip-

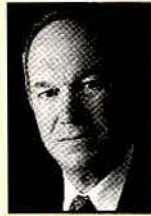
ment and technology for production of coaxial cable center conductors. **Brian D. Garrett**, Commscope president, said: "Since clad wire-center conductors represent a significant portion of our raw material costs, this purchase represents another big step in our ongoing cost reduction program." On January 1, Commscope bought **Alcatel's** \$35 million/year coaxial cable business in Seneffe, Belgium. (www.commscope.com)

Allen Telecom, Beachwood, OH, has sold

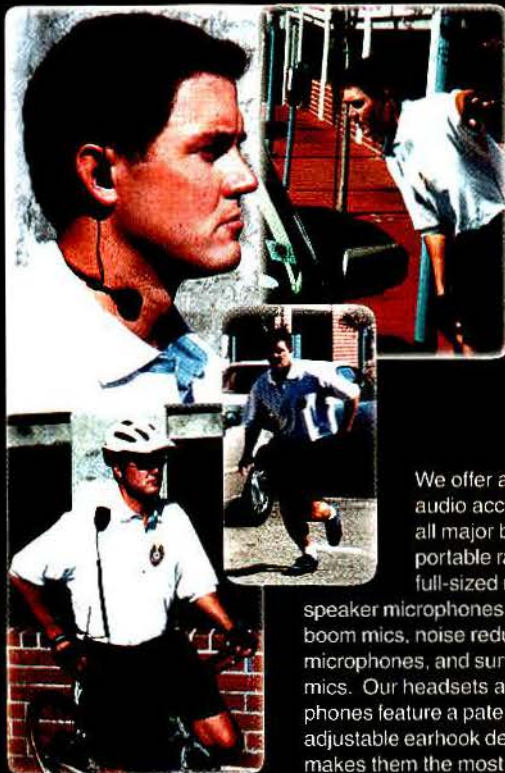
its Marta Technologies subsidiary to **Environmental Systems Products**. Marta operates centralized automotive emissions inspection programs in Ohio, Maryland and Florida. **Robert G. Paul**, president of Allen Telecom, said: "We are pleased with this transaction, which will provide continuity for Marta's operations and allow Allen Telecom to focus on our core business of providing equipment and services to the global wireless telecommunications infrastructure market."



Garrett



Paul



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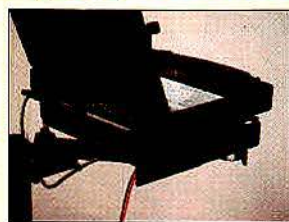
Circle (351) on Fast Fact Card

Console configuration features seven-inch pedestal for more space

Winsted's seven-inch pedestal riser component expands the console configuration possibilities available in its modular System/85 consoles. The pedestal raises the entire console seven inches to provide additional space under the work shelf. This extra height allows adequate space for wheelchair access or additional accessories under the shelf. When the shelf is positioned at a standard 28-inch height, it provides additional economical rack space above the shelf for easy access to VTRs and other electronics. The Model 85069 pedestal risers attach directly to the standard Winsted console pedestal. Two complete console systems include the new riser. The K8559 three-bay system, incorporating the higher riser configuration, and the alternative K8610 featuring the standard height work shelf. Both models produce additional rack space above the shelf.

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Port replicator accommodates laptop, notebook computers

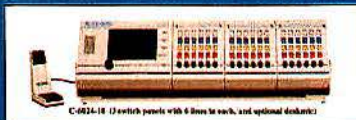


Gamber-Johnson's universal port replicator, Noteport UPS-24, uses universal adjustment design. It is a low-cost alternative that will accommodate laptop or notebook computers with USB technology by plugging the provided

USB connecting cable into the computer to provide power and port replication for serial, parallel or USB connected peripherals. The Noteport UPR-24 provides full-featured internal power supply, two USB ports and four serial ports, plus an optional parallel port dongle.

Circle (353) on Fast Fact Card

Console features desktop control



Vega's model C-6024 radio/telephone control console is a microprocessor-based, multiline,

multi-format, desktop radio control console. Its touchscreen and independent switches for line selection and instant PTT allow for ease of use. Any number of lines can be installed. With the appropriate number of switch panels, each panel accommodates as many as six line cards. Any line may be configured for either a dedicated two- or four-wire radio circuit, a dial-up access telephone circuit (identical to Vega's C-550) or a full duplex conventional PSTN telephone circuit. The console also allows for future expansion. Other features include an intercom switch that inhibits leased-line module control-tones, allowing an operator to talk to another console; and a per-line unselect volume control that adjusts the speaker level of the individual line receive audio.

Circle (354) on Fast Fact Card

E9-1-1 system handles several functions on single screen



Motorola's Commercial, Government and Industrial Solutions Sector has developed several new features and capabilities as well as a new name for its line of digital systems serving E9-1-1 call-taking and dispatch centers. The Centralink 2000 gives emergency call-takers the ability to handle several functions on a single screen. The call-taker can now use the computer keyboard function keys, a mouse click or the phone to

answer calls, make automatic call-backs, use speed-dialing, check on the status of calls or handle a transmission from a telephone device for the deaf (TDD). The system is based on a Microsoft Windows NT platform.

Circle (355) on Fast Fact Card

Console provides increased accommodation versatility

Evans' Identity is a new console product that provides versatility in technology accommodation and aesthetic design for control and command centers. Identity is designed specifically for technology-driven environments such as telecommunications network operations centers and utility control centers. The open-portal framework offers virtually no structural limitations to the size and configuration of equipment that can be accommodated. The frame retracts to a small footprint when supporting flat panel display technologies and adapts to changing equipment needs.

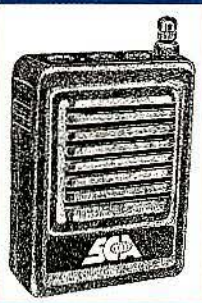
Circle (356) on Fast Fact Card

READERS' CHOICE

Of the new products in the September 1998 issue, this one generated the biggest reader response. For more information on this product, circle the corresponding Fast Fact Card number on the card found in the back of this issue, and mail the card to us.

Pager's antenna ups reception range

The Sceptar tone and voice pager from Shinwa Communications of America is a completely synthesized VHF pager with PC programming capability. The small pager tolerates rough handling. Its cellular-like telescopic antenna is designed to improve reception in areas that are beyond most pagers' ranges. It has up and down volume control buttons instead of rotating volume controls.



Circle (500) on Fast Fact Card

Portables offer 5W power, safe versions

The compact, rugged VX-400 series of land mobile portables from Vertex Radio Communications is available in VHF A, 134MHz-169MHz; C, 148MHz-174MHz; and UHF, A, 400MHz-430MHz; D, 450MHz-485MHz; F, 485MHz-512MHz. The portables meet MIL-STD 810 C/D/E ratings and are available in intrinsically safe versions. VHF and UHF versions feature a full 5W RF



power output rating with low-power level settings of 2.5W, 1W and 0.1W. DCS/CTCSS is programmable by channel as well as by 12.5kHz and 25kHz channel spacing. The portables are capable of 16 channels (8 + 8) and offer several scan modes. The portables measure 4" x 2.28" x 1" with battery, plus a 4" fixed antenna.

Circle (401) on Fast Fact Card

Compact panel antennas perform indoors

Celwave's Microtenna is a new series of eight indoor panel antennas that deliver performance for applications including ESMR, AMPS, GSM, DCS and PCS. The antenna units are economical, compact and durable, and they are available in a variety of patterns and gains, from unity to 6dB. A dual-band model covers all wireless serv-

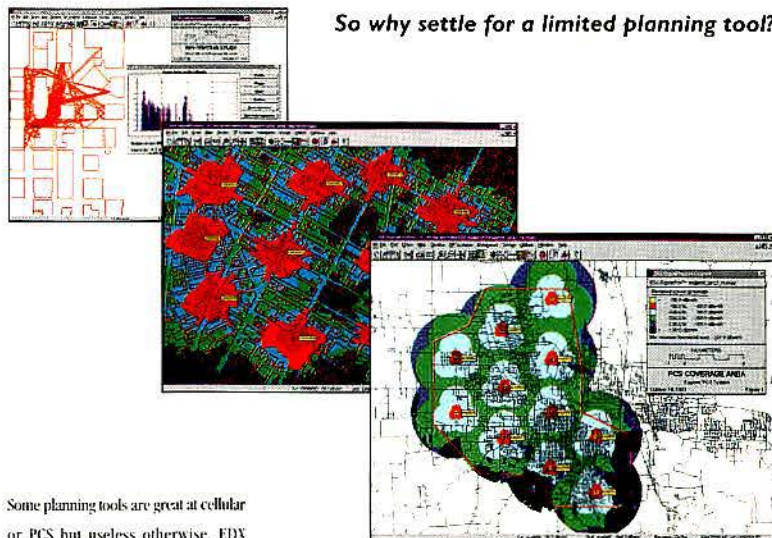
ices from 806MHz to 1,990MHz. The antennas feature a wall-and-ceiling mount that makes them simple to install and an unobtrusive off-white radome that complements building aesthetics. An integrated N-type connector permits the use of small-diameter cable connectors.

Circle (402) on Fast Fact Card

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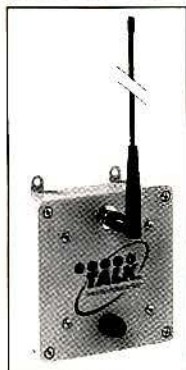
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Alarm transmitter alerts automatically



Ritron's Quick Talk is an automatic voice-alerting radio transmitter. Integrating advance digital voice recording technology, the weather-resistant transmitter monitors two switch inputs and transmits custom voice messages

over any VHF or UHF radio system, including repeaters. Battery-operated (six AA alkaline or NiCd), the transmitter permits one year of 24-hour monitoring of any dry contact closure such as thermostats, humidistats, momentary switches or any other switch. When a switch changes state, the transmitter alerts radio-carrying users immediately with a voice message of the status of pumps, lights, doors, fans, temperature, liquid levels, pressure limits, leak detection or power failures. Line-of-sight coverage is also available up to ½ mile with the standard antenna.

Circle (403) on Fast Fact

Mount receptacles offer new conductor design

Tru-Connector's upgraded line of 7/16 male and female panel mount receptacles use the type N mounting hole pattern to allow conversion from UG-58/U to 7/16 using the same 1" square exiting pattern without modification. Featuring a new mounting plate with an integral, raised conductor seal to create a tight fit and a solid female outer conductor, the receptacles provide less than 155dB or better typical intermodulation. Constructed with gold or silver center conductors, beryllium-copper contacts and Teflon insulators,

Tru receptacles can incorporate silver-plated or Trulustre (tri-metal-plated) brass bodies. Rated for 2,700VRMS and 50Ω impedance, applications include cellular base stations, communications and related equipment.

Circle (404) on Fast Fact Card



Data radios include internal diagnostics

The GB series line of data radios from **GLB** are compatible with the SNRDS radios. The radios measure 4.5" × 2.27" × 6" and are available in 138MHz-172MHz and 806MHz-906MHz frequency bands in addition to offering baud rates up to 9600kbps. Diagnostic options are available for RSSI, voltage level, internal temperature and power

output. The radios can be used in point-to-multipoint or configured as repeaters (store and forward). They can be used in applications such as waste management, water control, oil and gas, aeronautics, automatic vehicle locating, mobile terminal dispatch, surveying, ATM and DGPS guidance.

Circle (405) on Fast Fact Card

Embedded antenna supports dual frequencies

RangeStar International's Performa dual-band embedded antenna for wireless handsets operates on 800MHz cell band and 1,900MHz PCS frequencies. The embeddable antenna supports dual fre-

quencies for enhanced coverage and seamless roaming. It features a gain of 1dBi, measures 1.5" × 0.05" × 0.03" and weighs one gram.

Circle (406) on Fast Fact Card

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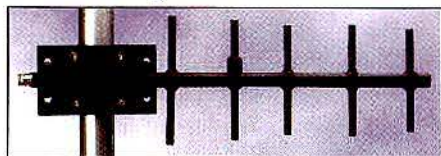
Meter detects RF, microwave radiation



General Micro-wave's model 2001 radiation hazard measuring instrument (RAHAM) is constructed in a rugged housing and measures exposure to potentially hazardous levels of non-ionizing RF and microwave radiation. The instrument covers a frequency range of 3MHz to 1GHz, measures the E-field over the wide dynamic range of 10V/m to 1,000V/m and features a three-element diode detector that provides an isotropic (omnidirectional) response. The alarm level threshold is set to 200V/m but can also be factory-reprogrammed to meet specific customer needs. Visual and audio alarm indicators are activated when the alarm threshold is exceeded. The instrument is suitable for operation in the environment of real-world field applications. The instrument and probe are enclosed within a single rugged housing that is designed to be rainproof and to survive a more than three-foot drop onto a solid surface. Operator controls are easily accessible and suitable for gloved users. The instrument measures 9.58" x 2.88" x 1.75" and weighs 1 pound. Standard accessories include carrying strap, carrying case and battery charger.

Circle (407) on Fast Fact Card

Yagi antenna offers durability outdoors



Maxrad's UHF and 800MHz and 900MHz yagi antennas are designed to withstand tough weather conditions. The yagi antennas feature five welded elements, 10dBi gain and an enclosed feed network with a type N female connector at the end of the boom. This design eases installation and enhances durability and performance, while providing protection from tough weather conditions. Each BMOY antenna series comprises three wideband models. The BMOY UHF series includes three models: BMOY4065 for 806MHz-866MHz, BMOY8245 for 824MHz-896MHz and BMOY8905 for 890MHz-960MHz. All models are available in a black-powder-coated finish and come with mounting hardware that allows positioning for horizontal or vertical polarization.

Circle (408) on Fast Fact Card

Modem delivers TNPP over paging control links

The TLM-1200 TNPP link modem 1200 from **Kantronics** delivers TNPP frames from a source site to one or more remote sites—point to multipoint—using radio control links. The TNPP feed can come from a paging terminal or any other serial source (such as a satellite feed), and the modem will accept frames at 1200 baud, 2400 baud, 4800 baud or 9600 baud. Transmission of these frames over the radio link is at 1200 baud using CCITT V.23 tones, thus eliminating the need for special, costly data-ready radios. For many

applications, a 1200 baud feed is sufficient, including light POCSAG and/or Flex traffic. The modems may be combined in pairs to filter a TNPP feed by destination, to remove frames with CRC errors and to renumber frames. A pair can also be used to change the rate of a TNPP feed because one unit is used for transmit (1200 baud-9600 baud). Terrestrial simulcasting systems can be created by pairing TLM-1200s with KPC-2000 controllers. The control links can be used later as backups.

Circle (409) on Fast Fact Card



RF Instrumentation Requirements?

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The new AEA model CIA-HF Complex Impedance Analyzer represents a **major breakthrough** in RF instrumentation. Until now, it was necessary to spend over \$10,000 to obtain a graphical Complex Impedance Analyzer.

With the CIA-HF you can get a **graphical representation** of SWR, Impedance, Resistance or Reactance of an antenna or RF tuned circuit with respect to frequency. The CIA-HF has an internal DDS (Direct Digital Synthesizer) sweep or single frequency generator for excellent frequency accuracy, stability and spurious response. The keypad is a splash-proof membrane type with audible keystroke feedback. Easy for the layman production tester to use in the normal mode, or select the **Extra Features Mode** for access to all the powerful capabilities.

Packaged in a custom rugged plastic hand-held plastic enclosure, the CIA-HF is meant to be used in the field or laboratory with eight internal AA batteries or an external 12 - 16 VDC power source. The unit is small enough to take up a tower to place right at the feed-point of an antenna under test or to use on a lab bench without taking up much space. The graphical Liquid Crystal Display operates in low light or direct sunlight environments.

The frequency range for the standard CIA-HF is **400 kHz to 54 MHz in one kHz steps**. The impedance, resistance and reactance ranges are **0 to 1000 ohms in three ranges**. In addition to the graphical presentations, the CIA-HF will show the following parameters in digital format: Relative Q factor, **2:1 SWR Bandwidth**, Phase Angle (**theta**), **Minimum SWR** frequency, Sweep width/division, SWR at center frequency (**Fc**), **Return Loss**, Rough indication of Inductance or Capacitance values, **DC Voltage (2 to 25 volts)**, (50 ohm) normalized impedance and the **distance to first short or open** in coaxial cable.

A **serial port** is provided with firmware drivers to communicate with a Personal Computer for purposes of controlling the CIA-HF and for downloading data and graphs to a PC for future reference. Possible applications include but are not limited to **tuning: antennas or RF resonate circuits, feedline stubs, RF filters, MRI circuits, baluns and matching networks**. Use an external loop on the end of a short piece of coax to make the CIA-HF operate like a stable and backlash-free **grid dip oscillator** with a graphical display of the relative Q factor. A beeping tone gives **audible feedback of SWR** at a single frequency for hands-free tuning of an antenna or resonate circuit without even having to look at the CIA-HF.

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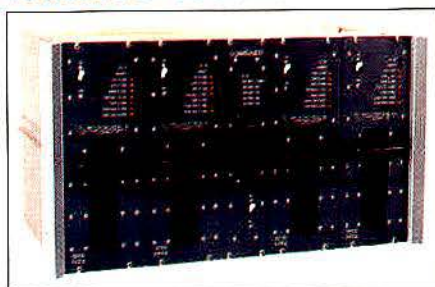
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Circle (38) on Fast Fact Card

Power amplifier system features feed-forward



MPD Technologies' multichannel, 200W, feed-forward power amplifier system uses state-of-the-art feed forward technology and accommodates AMPS, CDMA, cdma2000 and TDMA modulation formats. Each amplifier loop is microprocessor-controlled, ensuring IMD cancellation during any specified mode of operation. Typical IMD performance with any modulation format is 65dBc. Each of the system's four FFPAs can deliver 60W of output power. The FFPAs are combined using an active or passive combine. The rack-mount construction results in flexibility relative to system reconfiguration. Fifty-watt, 100W, 150W and 200W systems can be configured, depending on the number of FFPAs used. Each of the FFPAs can be controlled via a remote interface for detailed status monitoring and control. Typical applications for this amplifier system include fixed or mobile base station enhancement.

Circle (410) on Fast Fact Card

GPS unit offers color display, voice prompts



Magellan's 750NAV vehicle navigation system can be transferred from one fleet vehicle to another. The system features voice and visual driving instructions that tell the user when to make each turn and show the direction of the turn with arrow icons.

The custom route feature allows the user to control the route that is used. Choose among the shortest time route, the most use of freeways or the least use of freeways. The Roadexclude feature allows the user to tell the system what roads he does not want to travel, and they will be excluded from the route. Also included are features such as autoroute, off-road navigation and vehicle-independent positioning.

Circle (411) on Fast Fact Card

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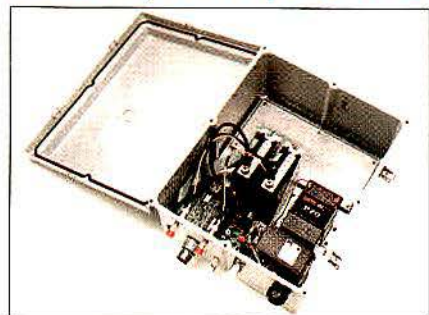
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Circle (61) on Fast Fact Card

Radio system protects outdoor applications



The MDS P70 packaged radio system from **Microwave Data Systems** is for outdoor telemetry applications, or for any location where radio equipment requires protection from harsh or corrosive environments.

The system is highlighted by a weathertight, padlockable enclosure (NEMA 44X) that may be tower-, wall- or pole-mounted. The enclosure houses two MDS transceivers, an optional backup battery, control circuitry and bulkhead-mounted lightning protectors. A spacious mounting plate and a 24Vdc power supply are included. An optional internal heater is available for use in cold climates, ranging to arctic conditions. The system is suitable for tail-end links or repeater applications, where the data ports of two radios are connected together via a short cable. For reliability, the system may also be configured as a redundant remote or master station.

Circle (412) on Fast Fact Card

Connector kit creates variety of interfaces

The Unidapt RFA-4023-01 from **RF Connectors** is a kit housed in a sturdy, foam-lined, hinged, ABS plastic case. It includes 43 universal adapters. All connectors in the Unidapt line are made of silver-plated, machined brass with gold-plated contacts and PTFE insulation. Using this compact, rugged kit, several adapter configurations can be available in seconds. Each adapter, when joined using the universal center adapter, creates many combinations of coaxial interfaces. Any male-to-

male, female-to-female, or male-to-female adapter can be produced quickly and easily; mix or match the pieces to create the required adapter. If a standard adapter is not immediately available, it can be made using the N, BNC, TNC, SMA, Mini-UHF, F, UHF and RCA components contained in the kit. The RF Sampler, right-angle, tee, double banana plug and double-binding-post adapters expand the possibilities.

Circle (413) on Fast Fact Card

Grounding kits attach to cable

Andrew's grounding kits are for installation with 2 1/4" Heliac coaxial cable. The Sureground and Sureground Plus kits protect radio equipment from the damaging effects of lightning strikes. The Sureground grounding kit for 2 1/4" cable has a self-securing ground strap that eliminates the need for attachment tools and reduces installation time. The kit includes a pretensioned solid copper clip-on grounding strap that ensures proper surface contact pressure between the strap and the outer conductor, and prevents damage from over-tightening. Once in place, the kit provides protection against lightning strikes as strong as 125kA. Sureground kits are now available for 7/8", 1 1/4", 1 5/8" and 2 1/4" coaxial cables. The Sureground Plus grounding kit combines a wraparound grounding strap with a preformed rubber weatherproofing boot.



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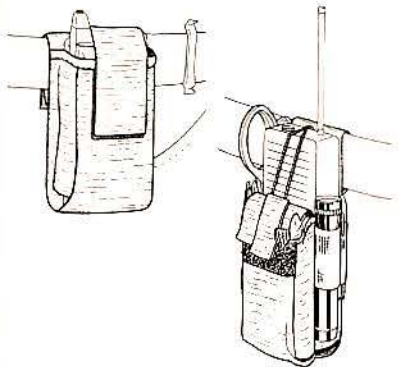
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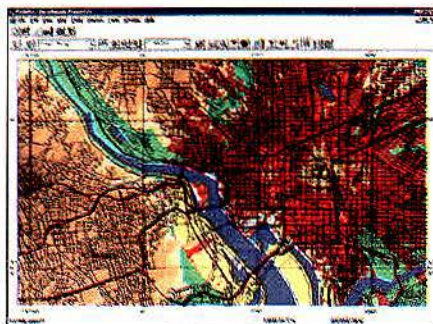
Earmark's radio headset, the HS-4S, is smaller in weight compared to the standard series 4 radio headset. Offered in simplex operating mode, the headset provides features required by individuals working in high noise who do not need hands-free operations. VOX is not available for this model. Simplified controls promote sharp reductions in training time and reliable operations under adverse conditions. A permanently fastened, rotary on/off/volume control, with detents, sets the radio for the precise environmental condition. The soft-touch, tactile PTT button lets the user know when he is transmitting. The close-mouthed,

NiTi alloy antennas minimize weight and resist permanent deformation when bent. This headset retains the series 4 product group's 23dB NRR. Thick walls protect the headset cups from structural damage in the normally abusive environment of industrial manufacturing or processing.



Circle (415) on Fast Fact Card

Design software offers 32-bit compatibility



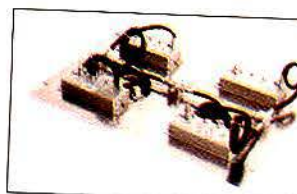
The new version of the RF network design software, Pathpro, from MLJ+JMS offers new features, including a new mapping interface: terrain, demand, and LULC data visualization; and full 32-bit compatibility. This version also supports directional fixed wireless antennas for wireless local loop and talk-back system design, measurement integration and model optimization using data collected with Erisoft's TEMS and Comarco's NDR systems. Pathpro's map engine is fully compatible with Mapinfo. The software can display and print any data files, projection systems and datums supported by Mapinfo.

Circle (416) on Fast Fact Card

VHF quadruplexer maintains low loss

The model 3160Q-(7, 9, 11, 13) custom VHF quadruplexer from Microwave Filter separates four incoming signals to four translators while maintaining low loss and high isolation. The unit is designed for the four passbands of 175.325MHz to 179.75MHz, 187.25MHz to 191.75MHz, 199.25MHz to 203.75MHz and 211.25MHz to 215.75MHz, but other models can be custom-designed to combine or separate any other four VHF channels. Other models are also available for UHF frequencies.

Passband loss is about 3dB, and mutual isolation is 25dB minimum. The quadruplexer comes with 75Ω type F connectors. Dimensions are about 19" x 10.5" x 4", and it is designed for indoor use.



Circle (417) on Fast Fact Card

Test system analyzes W-CDMA signals



Anritsu's test system integrates its MG3672A digital modulation signal generator and MG0314A W-CDMA modulation unit and outputs test signals in compliance with W-CDMA test specifications. The test system is

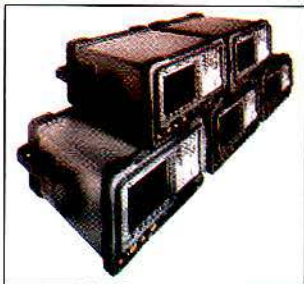
suitable for functional evaluations in the R&D and production of W-CDMA base stations and devices, as well as for performance evaluation of N-CDMA and TDMA mobile communications systems. Covering the 300kHz to 2.75GHz frequency, the signal generator can perform wideband analog and IQ modulation to 30MHz. Four expansion units can be simultaneously installed in the main unit to support various TDMA/CDMA systems. One unit can be used to directly output test signals that comply with W-CDMA, as well as other communication system standards such as PHS, GSM, PDC, NADC and DECT.

Circle (418) on Fast Fact Card

Analizers enhance performance

Hewlett-Packard's family of general-purpose, portable spectrum analyzers offer engineers measurement speed, accuracy and dynamic range. The ESA-E series' flexible platform allows users to enhance performance as requirements change. Each analyzer, which comes with a card cage for adding future capabilities, can be expanded to include application-specific measurement personalities such as GSM and CDMA, which are slated to be available in the future. The analyzers can help reduce manufacturing test time, time-to-market and costs. The spectrum analyzers provide 5ms full-span RF sweep time, 28 measurements per second and 19 when transferred over HP-IB (HP interface bus). Users can obtain virtually real-time responses when performing tests.

Circle (419) on Fast Fact Card



Receiver offers controller option

Rockwell Collins' knob-and-button-control option for the Collins 95S-1A direct conversion receiver eliminates requirements for traditional hands-on keyboard functions. The PC peripheral option allows users to dial in specific frequencies, noise levels and sensitivities instead of typing in parameters. The knob mouse unit is designed for use with the Collins 95S-1A, an all-purpose communications and surveillance receiver that supports a wide variety of radios receiving applications including government, military and commercial communications, spectrum surveillance and test systems. It is available with new equipment or can be installed as a retrofit product.

Circle (420) on Fast Fact Card

Soldering iron offers heat delivery

The PS-80 from Pace is a lightweight, heavy-duty, slim, soldering iron for demanding three-shift production environments. The iron features effective heat delivery at lower temperatures and tip temperature accuracy for repeatable performance with no calibration required. The design of the iron offers a cool-to-touch, cushioned grip handle for a balanced, comfortable feel. The plug-in heater is easy to remove and install without tools, and the high flex cord design provides maximum control and reduced fatigue while operating the handpiece.

Circle (421) on Fast Fact Card



Software makes complex waveforms

Wavetek's Waveform DSP2 is a software tool for creating complex waveforms and downloading them to Wavetek Arbitrary Waveform Generators (Arbs) via GPIB or RS-232. Waveforms can also be uploaded from Wavetek Arbs for editing. Waveform DSP2 runs in the Microsoft Windows environment, allowing for standardized features and an application look that make it simple to use. Waveforms can be created using any combination of drawing, math expression, digital storage oscilloscope (DSO) upload, arbitrary waveform generator upload and insertions from a library of waveforms or from data values from other applications such as Microsoft Excel. The standard Windows interface makes cutting, copying, pasting and editing sections of waveforms easy. The software easily switches between time and frequency domains.

Circle (422) on Fast Fact Card

TDM aids twisted-pair technicians



The model 3300 rugged, hand-held, metallic, time-domain reflectometer from Riser-Bond Instruments is designed to enable twisted-pair technicians and installers to locate faults in any twisted-pair application. The waveform TDR tests for opens, shorts, sheath faults, broken or loose conductors, load coils, bridged taps and water damage. Dual connectors allow for display and comparison of two live pairs or stored and live waveforms. High-energy, rechargeable batteries keep the TDR instantly ready for service calls.

Circle (423) on Fast Fact Card

Software incorporates Windows NT

HTE's full suite of enforcement software products incorporate Microsoft Windows NT. Policeworks is one of the first in a series of products under the company's new HTE-government brand-umbrella to use Windows NT. The software is a comprehensive tool set suite for law enforcement that automates the entire process from dispatch to disposition, improving efficiency and increasing officer safety. Some of the enhancements include a message switch that lets an agency configure the system to tailor features and functions to its requirements. The software includes a new interface for report writing, featuring that features graphic icon navigation buttons. Mobileflash provides remote configuration and application updates to hardware in the field, keeping information correct and avoiding hardware downtime.

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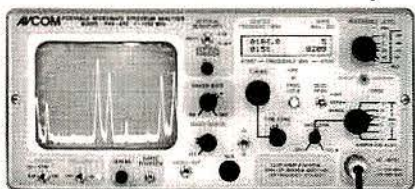
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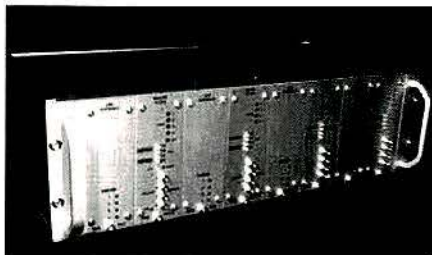
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Batteries support two-way radios

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Circle (425) on Fast Fact Card

Radio modem offers power-conservation mode

Johnson Data Telemetry's Integra-T radio modem is a joint development by JDT and Dataradio, providing RF specification and modem technology. The modem is user-friendly and designed with advanced features and no complicated system set up. With 5W RF output power in UHF, VHF and 900MHz MAS, the modem offers features such as no dribble bits, data activation and power conservation modes required for telemetry and SCADA systems. The modem provides built-in diagnostics to aid users in maintaining the health of their data commu-

nications network. System statistics can be gathered with each transmission on-line while the application is running. These on-line diagnostics can indicate a problem before a costly system failure occurs. Should the on-line statistics raise a question regarding performance, more in-depth information can be gathered through the off-line diagnostics. Maintenance can be scheduled, avoiding the cost of overtime and system downtime. On-line and off-line diagnostics are standard with every modem.

Circle (427) on Fast Fact Card

Antenna enhances in-building communications



Antenna Specialists' fixed station dual-band antenna is designed to enhance in-building wireless communications. This single

antenna provides coverage for cellular, PCS, DCS, GSM and ISM frequencies. It is easy to install and eliminates multiple indoor antenna systems. The ASP-3561 omnidirectional,

vertical-polarized antenna meets all worldwide wireless standards operating in frequencies of 824MHz-960MHz and 1,710MHz-1,990MHz. Built with capacitive fed, broadband microstrip circuitry and housed in a rugged ABS radome, it assumes a low-profile, unobtrusive appearance. The antenna measures 8.1" in diameter by 2.5" deep, complete with a type-N female bulkhead connector, and mounts with three 1" wall anchors.

Circle (428) on Fast Fact Card

Single-cell batteries offer longer float life

Hawker Energy Products has increased the float life for the Cyclon single cell and Genesis product lines. Through process improvements and testing, the company has documented that the pure lead-tin rechargeable batteries are 10-year-life products at 25°C, and 15 years at 20°C. Previous float life specifications were eight-plus years at 25°C, and 10 years at 20°C. In these batteries, pure lead-tin electrochemistry helps the product survive extreme temperatures. The purity inhibits corrosion and acid vapor venting. The starved electrolyte system prevents dry out through efficient recombination of gases.

Circle (429) on Fast Fact Card

Encoders offer steel keys, gold contacts

The P-7 and P-8 series of DTMF-encoders from Pipo Communications are designed with steel keys and waterproof, dustproof sealed gold dome contacts. The encoder and keyboard have been fully tested and are ready for a customer installation on radios or systems that are exposed to harsh or abusive environments. Other features include brass inserts with stainless steel screws and a wide temperature range (-22°F to 160°F). The encoders offer low distortion. The miniature design fits most radios, and all keyboards come in black.

Circle (430) on Fast Fact Card

Splitter divides signals for cellular leaky cable

MicroLab/FXR's power splitter splits high-power cellular signals in the ratio of 80:20, as might be required to feed signals down a side branch in a leaky cable installation. The unequal power splitter, DG-54 series, combines the low-loss benefits of the reactive two-way power splitter with the unequal split nature of the directional coupler. It has minimal reflections, few solder joints and an air dielectric. Its mechanical shape also allows simple attachment to a wall or ceiling using clips or clamps.

Circle (431) on Fast Fact Card

Battery replacement fits Ericsson radio



JBro Batteries' JB-3278, NiCd, 7.5V, 1,800mAh is a replacement battery for the GE/Ericsson MRK radio. This 3.84" x 2.85" x 1.10" replacement is available now under part #1399. The battery comes with an 18-month prorated warranty.

Circle (432) on Fast Fact Card

Dry loads, attenuators offer low VSWR



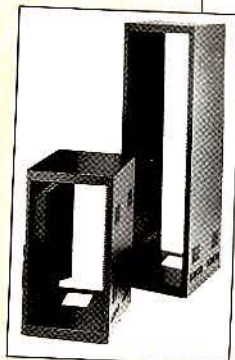
The 100W and 150W Square series of RF dry loads and attenuators from Bird Component Products has an extended frequency range of dc to 2.4GHz for use in cellular, data, ISM, land mobile, paging, PCS or SMR and ESMR applications. The products offer low VSWR, compact size and a design that uniformly dissipates heat along the entire length of the load or attenuator. A square cross section and compact dimensions make this product space-efficient where multiple units must be used in close proximity. The 100W models weigh about 2.8 pounds and measure about 7.55" x 2.75" x 2.75". Approximate dimensions of the 150W units are 8.3" x 5" x 4", and weight is 5.5 pounds. The 100W models can be mounted vertically or horizontally. Operation of the 150W loads and attenuators is limited to the vertical position. Tri-alloy plated N connectors are standard, and IEC 7/16 connectors can be specified. Cooling fins are black anodized aluminum. The new loads and attenuators are 50Ω devices.

Circle (433) on Fast Fact Card

Vertical racks allow venting equipment

The 35" (20U) model 90011 and the 70" (40U) model 90020 from

Winsted are standard EIA 19" vertical racks. They are completely welded and ready for the safe installation of heavy equipment. They come with vented sides, an open base for cabling, and adjustable punched rack rails with lacing bar. The heavy-duty steel cabinets are 40 1/2" and 74 1/2" x 22 1/8" x 26" with an attractive mar-resistant black textured enamel finish. Universal shelf support brackets have been added to the line of vertical rack accessories. They fasten to the front and rear rack rails of any 19" EIA cabinet with depths from 22" to 36". The brackets are strong and will support a wide variety of products that require a 24" deep working surface.



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Circle (77) on Fast Fact Card

Catalog features expanded line



IFR's 1999/2000 *Test and Measurement Catalog* features descriptions of the company's expanded product line of commercial and wireless test sets, signal sources and analyzers, counters and power meters, avionics, spectrum analyzers, microwave, telecommunications, ATE and systems and services. The catalog includes a 12-page,

four-color product line overview section and ordering information of IFR sales offices.

Circle (451) on Fast Fact Card

Kenwood redesigns Web site

Kenwood Communications has redesigned its Web site, located at www.kenwood.net. It features e-commerce capabilities, improved graphics and enhanced features for dealers and consumers. The new site allows on-line shopping for Kenwood merchandise, including consumer radio products and accessories. Visitors to the site can also purchase Kenwood logo clothing. Dealers can order banners and other dealer-only promotional products. Kenwood Systems, the trunked radio systems division and the Kenwood Amateur Radio division also have updated their presence on the site.

www.kenwood.net

EMC center offers resource manual

The University of Oklahoma Center for the Study of Wireless Electromagnetic Compatibility (EMC) has published a new resource manual designed to provide vital information needed to manage electromagnetic compatibility issues in hospitals. Development of the Managing Wireless Electromagnetic Compatibility in Healthcare Resource Manual was funded by CTIA. The manuals are available through the University of Oklahoma Wireless EMC Center.

Circle (452) on Fast Fact Card

EIA publishes publication index

EIA, the Electronic Industries Alliance, has released the 1999-2000 edition of the *EIA Publications Index*. It lists more than 60 publications available through EIA, dealing with market growth and industry trends, government activities in terms of federal and state legislation and regulations, consumer education and career guidance, among other topics. EIA will also be adding the index to its Web site located at www.eia.org.

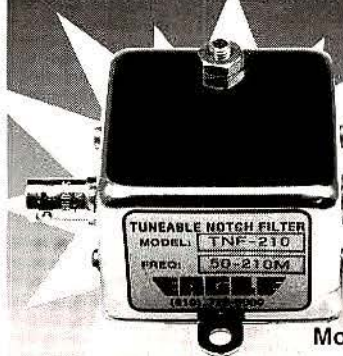
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Jensen Tools updates catalog

Jensen Tools' updated version of its 300-page *Master Catalog* contains 50 pages of Jensen tool kits as well as hundreds of pages that feature products from other major manufacturers including test equipment, power and specialty tools, wire and cable, equipment for soldering, telecommunications and computers.

Circle (454) on Fast Fact Card

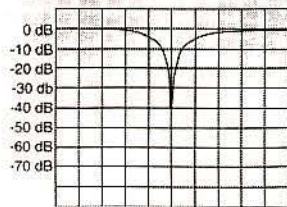
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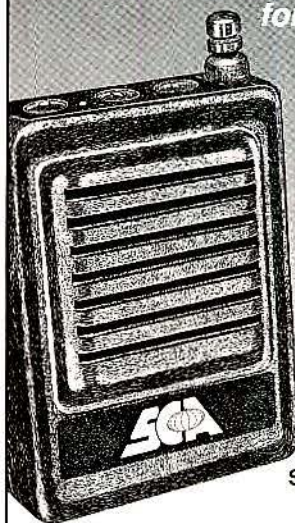
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Contreras

Fred Goodwin joins DX Radio Systems, Los Angeles, as director of sales after 20 years of industry experience from General Electric, Uniden, Standard Communications and Gulf Communications.

Changes at TPL Communications, Los Angeles:

Sandra Berber, account manager, handling bilingual and international accounts, as well as representatives, distributors, OEM accounts and dealers; comes to TPL with 10 years experience in commercial communications. **Kathy Torres**, inside sales coordinator for TPL, advances to assistant sales and marketing manager.

Members of the Radio Club of America (RCA) elect **Mercy S. Contreras** as vice president; she moves up from her position on the RCA board of directors. Contreras is group publisher for *Mobile Radio Technology* and three other Intertec Publishing magazines.

Jeff Wright becomes associate sales manager at Newmar, Newport Beach, CA, after experience as a manufacturer's rep in the marine and sporting goods industries.

Paul Vaccaro departs Transcrypt/E.F. Johnson, Lincoln, NE, as director, North American systems sales, to join SmartLink Development Network, Apex, NC, as director of sales, North America and Canada.

James Reeves advances to general manager of Tecom Industries, Chatsworth, CA, and corporate vice president of Trak Communications, Tampa, FL, after serving as Tecom's vice president of marketing and contracts.

Changes at Motorola, Schaumburg, IL:

Christopher B. Galvin, chief executive officer, is elected chairman of the board. **Gary L. Tooker**, chairman of the board, retires, but will serve as vice chairman of the board through the end of the year. **Robert W. Gowney** continues as president and as a member of the Office of the Chief Executive and the Motorola Board of Directors.

Steven J. Gilbert, chairman of Gilbert Global Equity Partners, joins LCC International's (McLean, VA) board of directors.

Changes at Advanced Charger Technology (ACT), Atlanta:

Gary Leonard leaves Stratix, Norcross, GA, as vice president of sales and marketing to join ACT as general manager of two-way radio sales. **David Grant** departs AER Energy Resources, Atlanta, as eastern regional sales manager to join ACT as director of mobile sales. **Mark Horne** joins ACT as director of marketing after working with the Advanced Technology Development Center at Georgia Institute of Technology, Atlanta. **Ray Rocque**, director of sales, advances to director of international sales.

Sung-Moon Yang leaves Hyundai Electronics America's Wireless Telecommunications division as vice president to join Tadiran Microwave Networks, Houston, as senior vice president of engineering.

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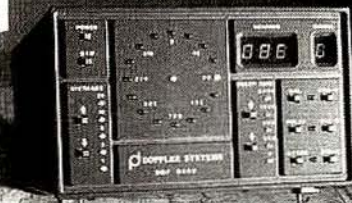


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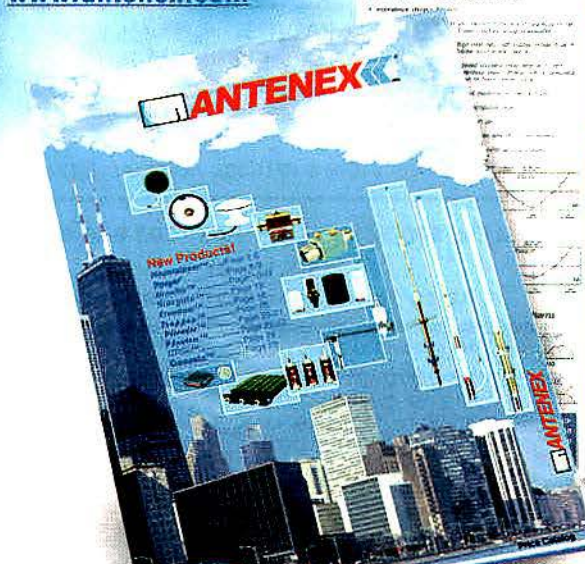
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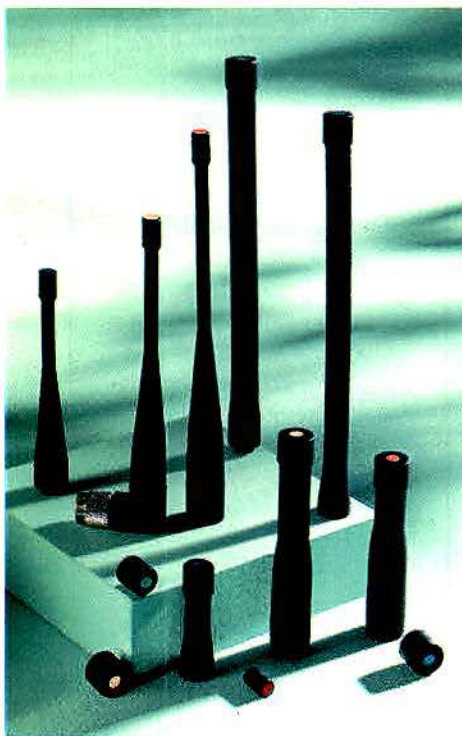
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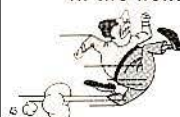
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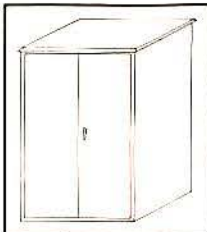
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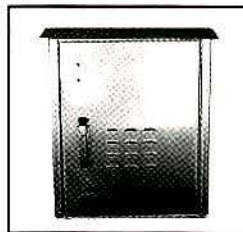
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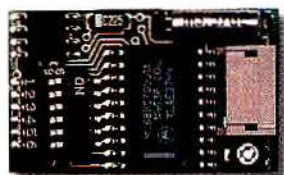
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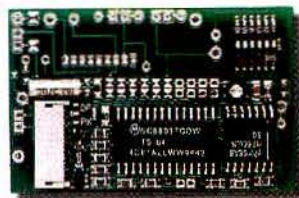
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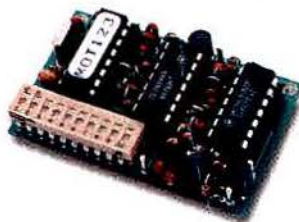
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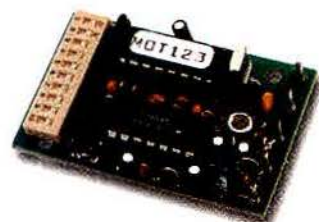
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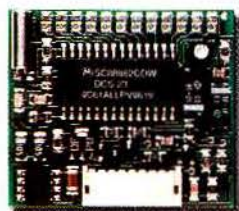
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